PRICE 50 CENTS

American Machinist

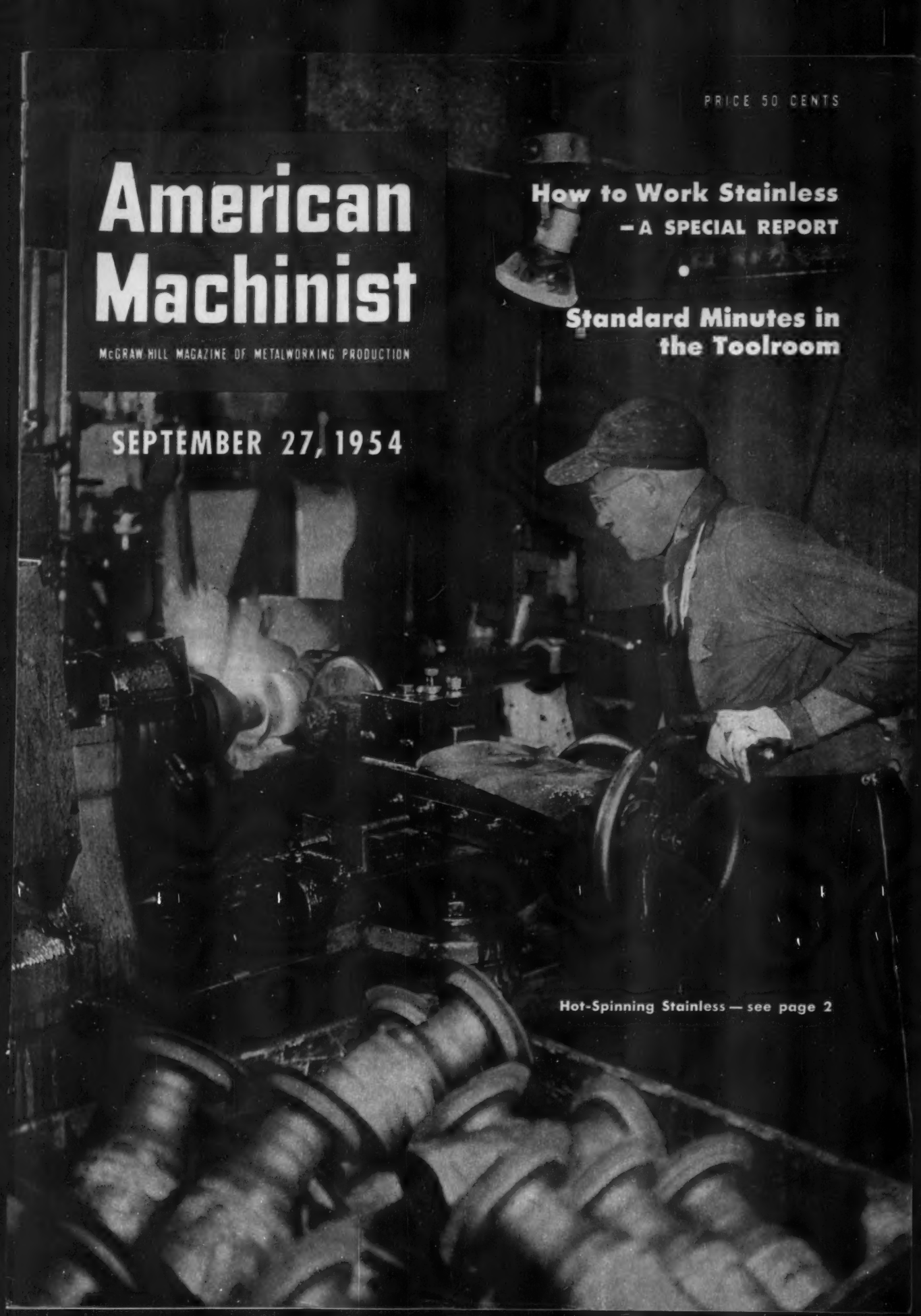
McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

SEPTEMBER 27, 1954

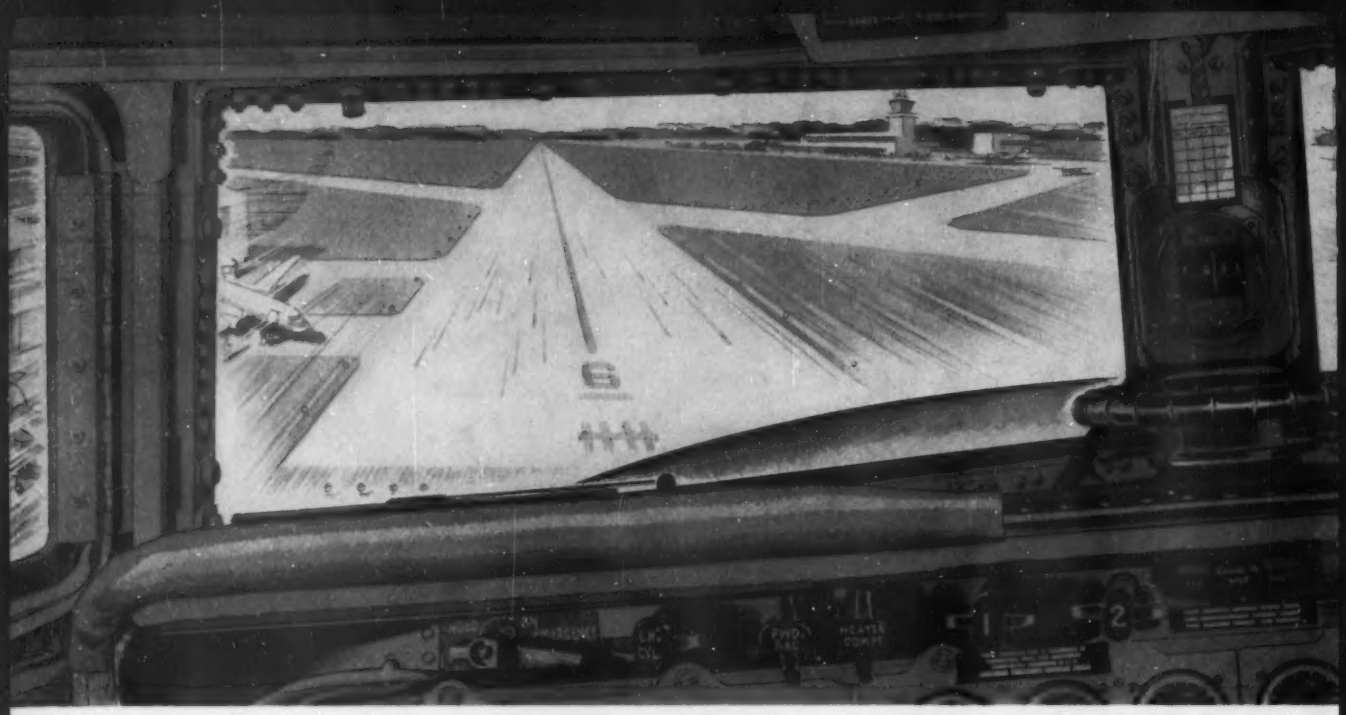
How to Work Stainless — A SPECIAL REPORT

•

Standard Minutes in the Toolroom



Hot-Spinning Stainless — see page 2



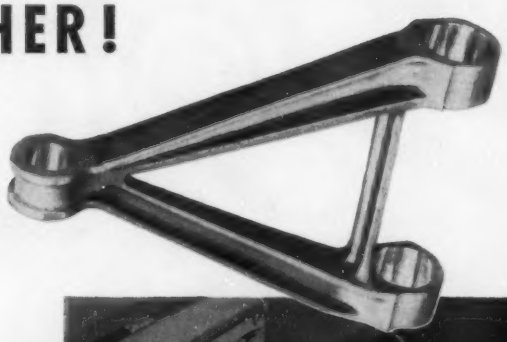
DOWN LIKE A FEATHER!

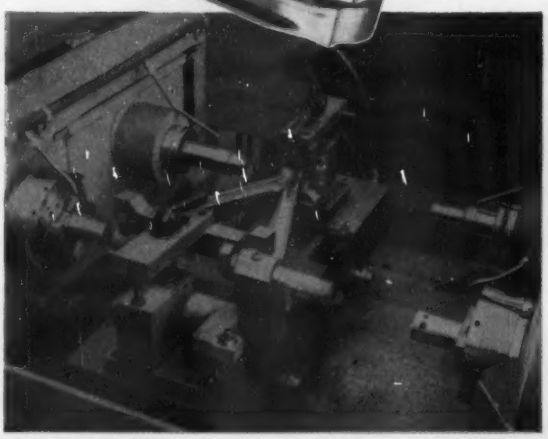
. . . a little safer, a little smoother because this part was BORIZED*

You're heading for the runway on final approach — fifty tons of airliner hurtling through space at over 100 miles an hour, yet settling to the earth as lightly as a feather. This is the time when a lot of things must work *just right.*

That they do so, thousands of times a day at airports the world over is a real tribute to the aviation industry. Such performance is made possible only through the utmost precision in every step of manufacture. That's why so many parts of the modern aircraft are borized. Here, for example, is a torque arm for a landing gear, borized on a Heald Model 422 Bore-Matic.

Whenever a part is borized, you can be sure of three things. A finer, longer-lasting, precision made part. Important savings in time and production cost. A definite competitive advantage for your product. That's why IT PAYS TO COME TO HEALD.





This Model 422, is used to bore, counterbore and chamfer seven different torque arms for landing gear components. Aligning rails on both the boringhead bridges and the fixture sub-base aid in accommodating the various parts.

Basic fixture equipment consists of angle plate type with swinging gate locator and hand cam clamps — gate locator is interlocked so that machine will not operate unless part is correctly located.

* *Precision finished by a Heald-engineered method on a Heald Bore-Matic.*

THE HEALD MACHINE COMPANY

WORCESTER 6, MASSACHUSETTS

Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York

American Machinist

MAGAZINE OF METALWORKING PRODUCTION

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ABC ABP

chips

HOT SPINNING . . . Our cover photo was taken at Vollrath Company, Sheboygan, Wis, and shows a job which company engineers decided could be done most efficiently by hot spinning, because of the amount of reduction involved. 18-gage, Type 304, stainless blanks are first drawn, then spun to a final neck diameter of 2¾ in. The parts are urinals for the US Army Hospital Corps.

STAINLESS SCOOP . . . Our Special Report in this issue is quite unusual—the joint information from all producers of stainless on how to fabricate each type, welded into a combined and compact story by Richard E Paret of the American Iron & Steel Institute. The fabricability table that is the heart of this report shows the relative ease of working each type of stainless by each method; where some difficulty is likely to arise, the nature of this difficulty is described.

TOOLROOM STANDARD . . . Incentive systems *can* be used on nonrepetitive work, and have been so used successfully for at least ten years, in contrast to general opinion. We bring you, as our lead article, the arguments of a leader in such installations (see biog). Toolroom jobs can be figured from the blueprints by using suitable "standard element times."

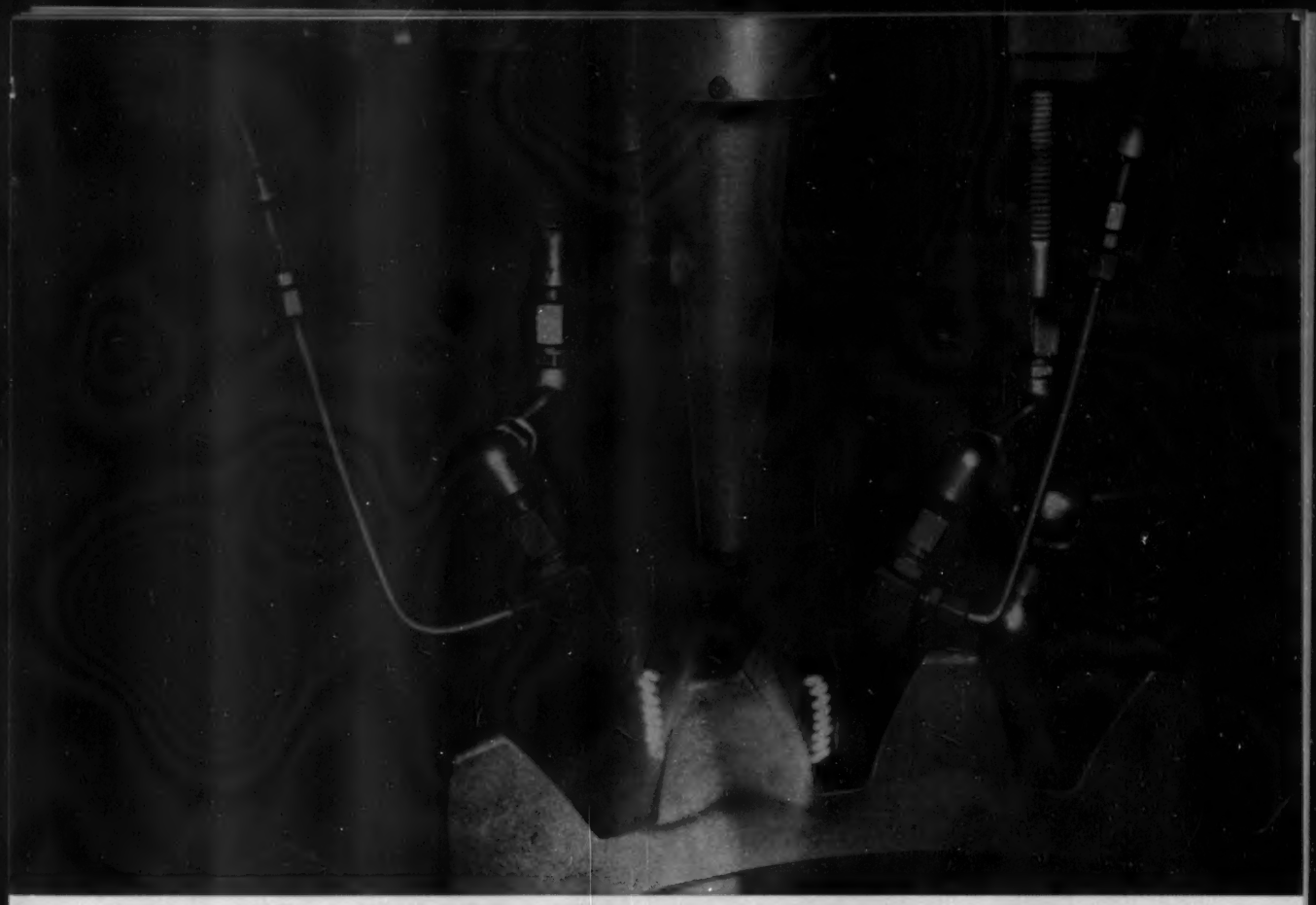
TOOLING . . . We have a spread of shop shots from half a dozen sources, covering as many subjects, including an air-router adapter, plaster locater pads, multiple bandsawing, leveling a worktable, and a shielding job. For more tooling data, see our every-issue Practical Ideas.

DIES FOR PLASTICS . . . Experimental and short runs back up high die costs—usually. But Economold process beats costs by using simple, laminated aluminum dies on an economical transfer molding machine. Two pages show how.

WELDED TUBE . . . Servel assembles gas-refrigerator tubing by automatic hidden-arc welding, replacing hand welding on some operations. The new special welders operate at 40 to 60 ipm. Highlights of the process are given in a page in this issue.

COMING . . . *AM* for Oct 11 will include a 16-page Special Report on rotating workholders—the second instalment of a workholding series. There'll also be articles on dial feeds, on mitering strip, on repetitive accuracy in cutting, on bore gaging at Dodge, on the role of the tool checker, on excess, rejects, on heated dies forming Ti, and several other articles. The cover will show a slab miller with a fixture that picks its own work off the conveyor.

TOOLROOM INCENTIVE . . . R M (Dick) Crossan was graduated from MIT in 1940, did some designing on Maytag washers and was general foreman of tools and gages at Remington Arms, then became a management consultant in 1944. He took a 3-month MTM training program to Sweden in 1950, stayed there 2½ years as manager of overseas operations for MEC. In 1953, he studied 20 Formosan factories for the Nationalist government—not paid for by the US. He is now a veep at Serge A Birn Company, Inc, Louisville, after installing toolroom incentive plans all over the place including two in Sweden, and teaching MTM programs since 1948. He tells how toolroom incentives work in our lead article.



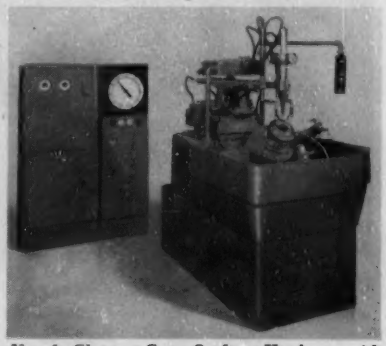
It uniformly controls surface hardening of gear teeth

You can step up the wear resistance of gear teeth greatly with Gleason Surface Hardeners. They provide localized hardening *without distortion* because of uniform temperature control.

Key to this performance is the radiation pyrometer and electronic controls. That vertical gun-like barrel in the center of the photo above is the radiation pyrometer. It is focusing directly on the tooth being hardened. As the oxyacetylene burners heat the tooth, the thermopile receives radiant energy from the heated metal. An electronic balancing device converts that energy to control forces which govern the travel of the burners along the tooth.

This makes surface hardening of gear teeth an exact operation. There is no measurable distortion because only the gear teeth are heated and each tooth is heated uniformly on both sides. The region of hardness is limited to the wearing surfaces, thus greatly increasing gear life.

Gleason Surface Hardeners assure absolute uniformity of all teeth on a gear and every gear in a lot. They are adaptable to hardening straight bevel, spiral bevel, Zerol, spur, herringbone and helical gears. For additional information, write for the booklet "The Surface Hardening of Gear Teeth."



No. 1 Gleason Gear Surface Hardener with electronic control unit. Accommodates bevel gears up to 24" pitch diameter, spur and helical gears up to 30", internal gears up to 24" outside diameter.

GLEASON WORKS

Builders of bevel gear machinery for over 85 years

1000 UNIVERSITY AVE., ROCHESTER 3, N. Y.

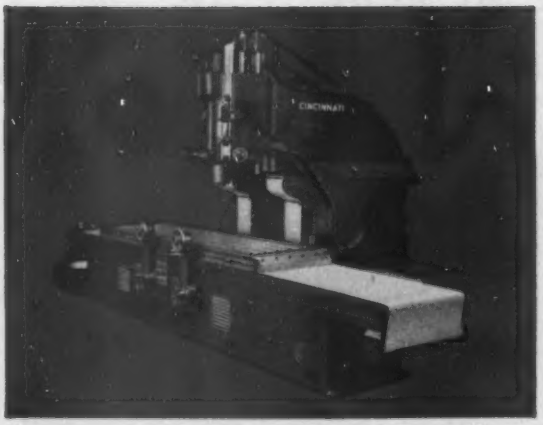
See these machines in Booth 454 AT THE NATIONAL METAL EXPOSITION, Chicago, November 1-5, 1954

Aid to production of large parts

HYDRO-TEL'S FLEXIBILITY AND EASE OF OPERATION . . .

aid production in this manner: When the job requires manual traverse of table and cross slide, it can be accomplished with practically no effort, for hydraulic power does the work while the operator merely rotates a handwheel. Power controls are convenient and easy to operate, too. The flick of a lever quickly positions the table, and a second lever operates the cross slide just as quickly. Each lever controls rapid traverse and feed rates in both directions; they can be operated in unison or independently. No time need be lost in positioning the work and cutter. Other factors being equal, easy operation and flexibility definitely increase production. Operators like the Hydro-Tel, too, so give your operators and production schedule a break by replacing your outdated milling machines with CINCINNATI Hydro-Tels.

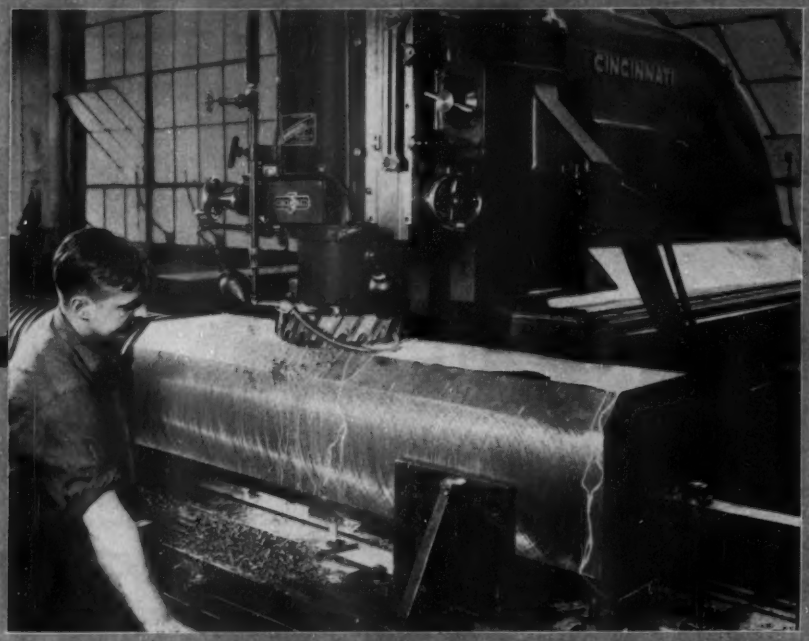
THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO



CINCINNATI 28" Vertical Hydro-Tel Milling Machine. Complete data may be obtained by writing for catalog No. M-1773-1.

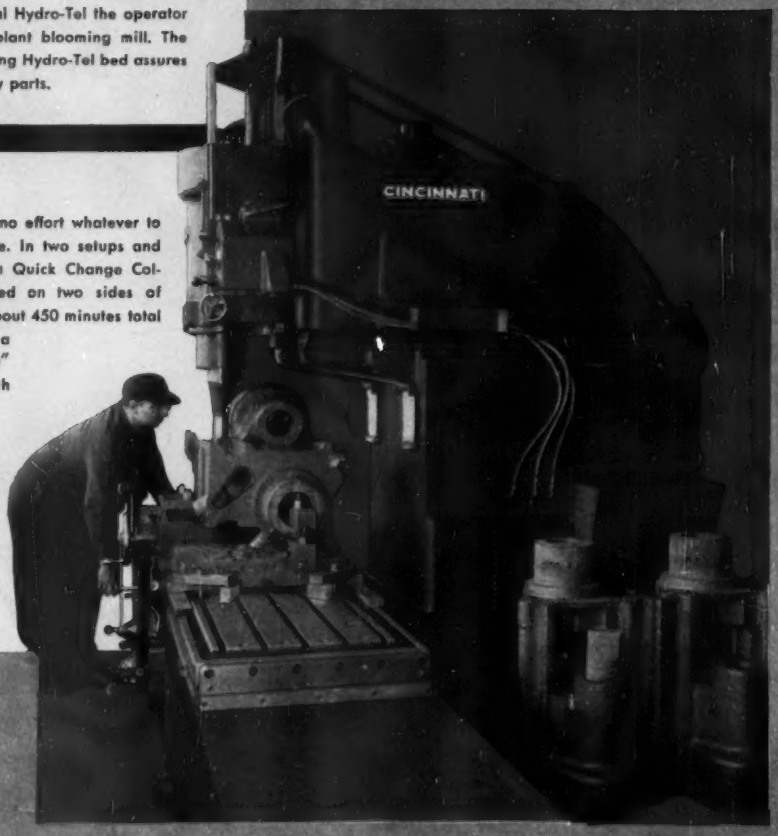
CINCINNATI

MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES • METAL FORMING MACHINES • FLAME HARDENING MACHINES
OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID



On this CINCINNATI 28" Vertical Hydro-Tel the operator is milling a part for a steel plant blooming mill. The rigidly constructed and extra long Hydro-Tel bed assures accurate milling of large, heavy parts.

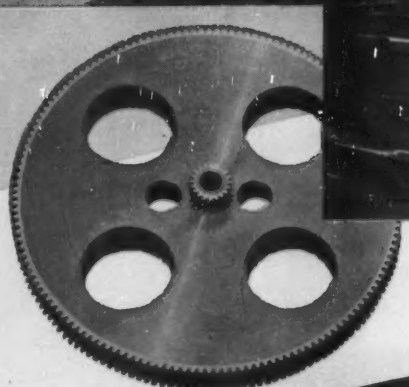
Large, heavy castings add no effort whatever to manual control of the table. In two setups and with the aid of CINCINNATI Quick Change Collets, 18 surfaces are milled on two sides of vertical head castings in about 450 minutes total time. The machine is a CINCINNATI 28" x 120" Vertical Hydro-Tel with raised rear base.



FINE PITCH

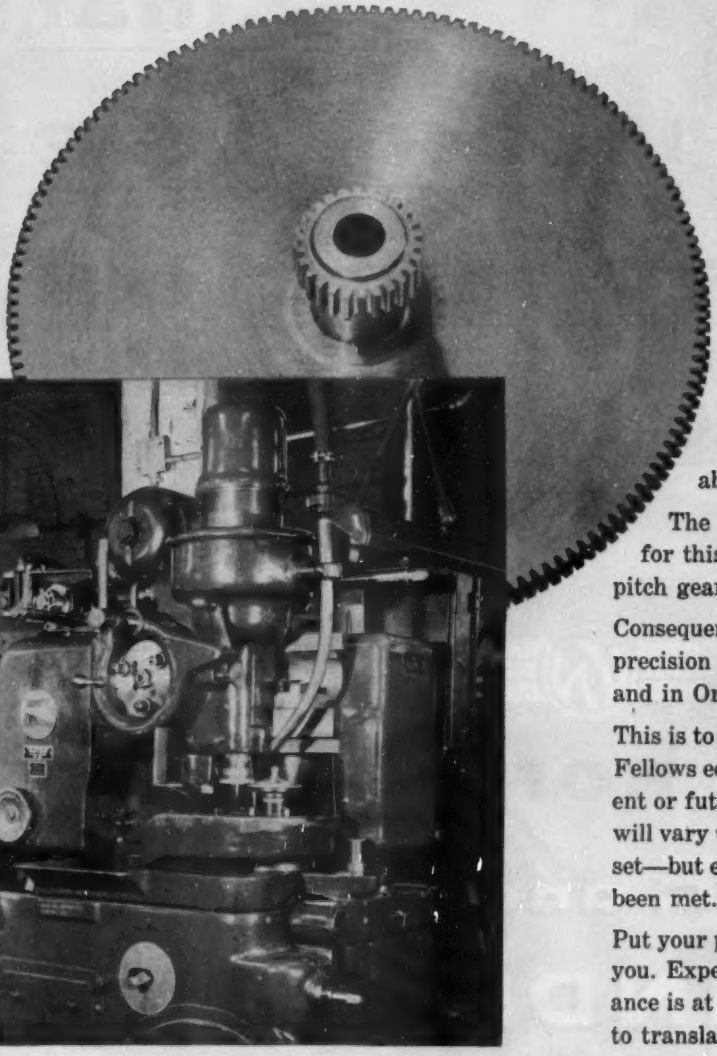
THE FELLOWS

Up to 3 inches P.D. describes the range of the Fellows Fine-Pitch Gear Shaper—fast-stroking (up to 2000 per minute) for extremely fine-pitch (100 and even 200).



THE *Fellows*

METHOD FOR ALL SIZES OF *fine pitch* GEARS



Over 3 inches P.D. the Fellows 7-Type Gear Shaper extends range on fine-pitch work to 7 inches. Unparalleled versatility and quick change-over sets your shop up for economical small-lot jobs as well.

Automation—the instrument control of manufacture—ushers in a Second Industrial Revolution. It is all about us, already!

The *super-precision* of control instruments for this new 'age' requires *quality* in the fine-pitch gear components.

Consequently there is really no substitute for the precision inherent in the Gear Shaper Method—and in Original Fellows Cutters.

This is to remind all in the instrument world that Fellows equipment covers the size-range for present or future design requirements. Cost per piece will vary with the closeness of the tolerance limits set—but even the most precise specifications have been met.

Put your problem up to the Fellows Office nearest you. Experienced, intelligent, cooperative assistance is at your command—and also the machines to translate promise into performance.

GEAR SHAPER COMPANY

Head Office and Export Department: 78 River Street, Springfield, Vermont.
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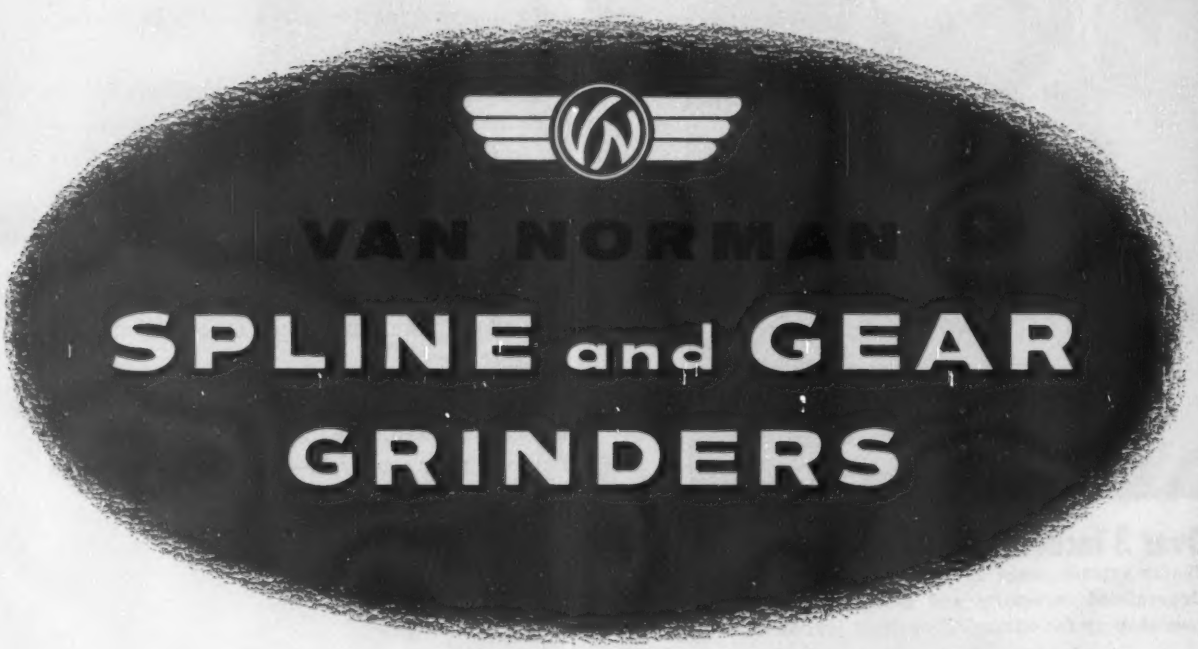
For Finish, Accuracy

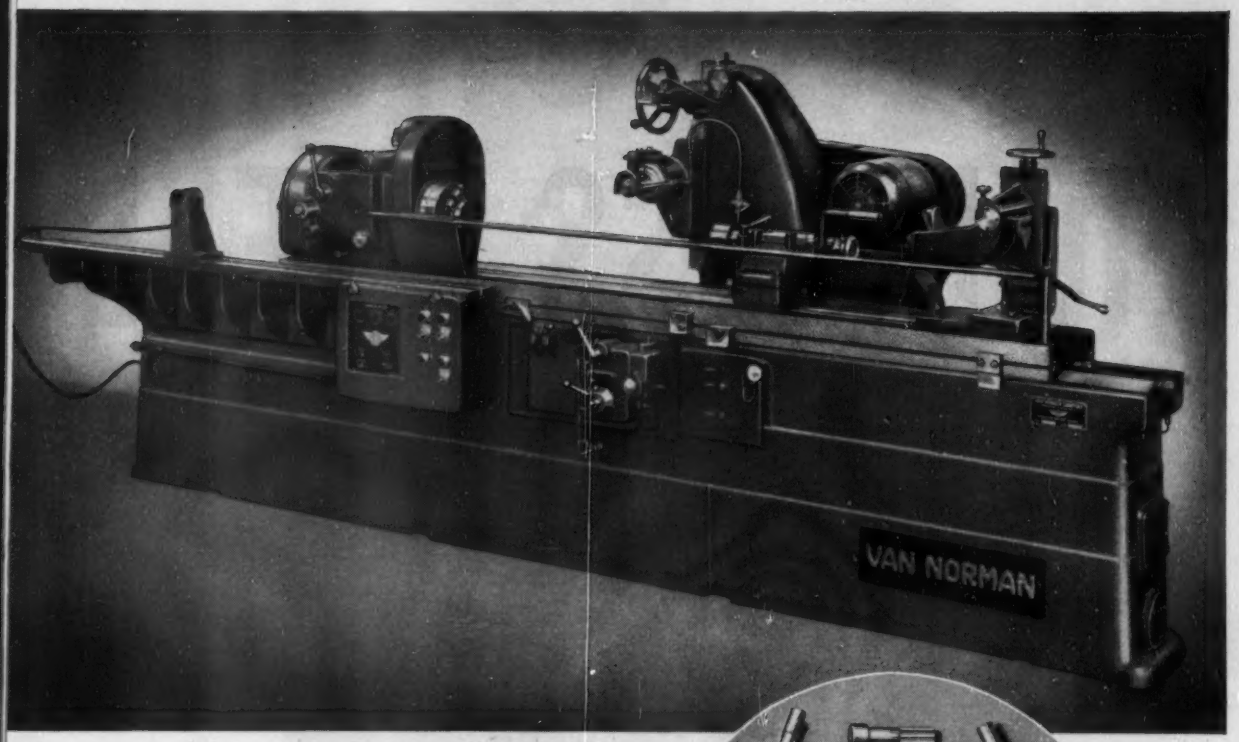
...that INCREASE PRODUCTION ...CUT COSTS



VAN NORMAN

MANUFACTURERS of—Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.

and Speed...



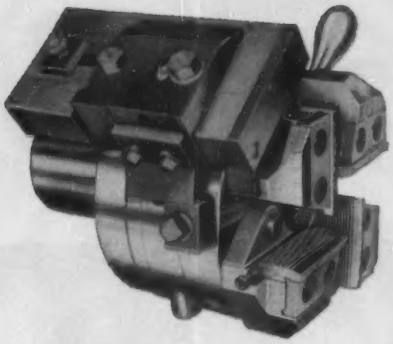
Operating on an automatic cycle with formed wheels, these Van Norman Grinders give you high finish and accuracy at speeds that increase production and reduce costs.

These grinders are adaptable for grinding internal and external helical or spur gears . . . straight taper and helical splines . . . and can be applied to shave splines.

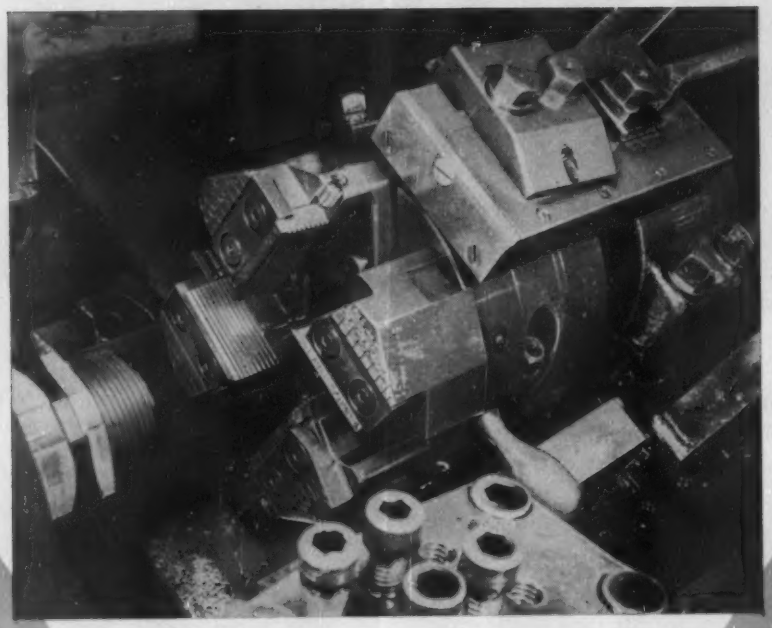
Van Norman Engineers, specialists in grinding, are available to help you solve your spline and gear grinding problems. Write for their assistance, today. There is *no* obligation for their services.

Typical parts ground at high production speeds on Van Norman Spline and Gear Grinders

COMPANY | **SPRINGFIELD 7, MASSACHUSETTS**



STAINLESS STEEL



TAPERED THREADS

cut with Better Finish
Longer Tool Life

1½" Tapered Pipe Threads are cut in 304 stainless steel reducing bushings at Camden Machine Company, New Haven, Conn. These threads are produced by a 1¼" LANDMATIC Taper Attachment Head on a 3¼" Gridley single-spindle automatic at 15 surface feet per minute.

The thread finish is greatly improved from previous methods and 1000 pieces are completed between chaser grinds—an increase of more than 10 times.

These improved results can be entirely attributed to the use of the Taper Attachment and the free cutting action of the Landis Tangential Chaser. In operation, as the die head advances onto the workpiece, the movement of the die head cam along the cam follower of the taper attachment expands the chasers on diameter. This produces a tapered thread corresponding to the taper of the cam follower. Cutting action is limited to the throat section or chamfer of the chaser, allowing the thread to be cut quickly with little "cold-working." This action reduces cutting strains to a minimum and results in uniform tapered threads.

LANDIS Taper Attachment Heads are stationary self-opening heads for cutting tapered threads of all types. Six sizes of heads thread all diameters from ¼" to 6".

When writing for additional information, ask for Bulletin F-90.

THE WORLD'S LARGEST MANUFACTURERS OF THREADING EQUIPMENT - CUTTING - TAPPING - GRINDING - ROLLING

LANDIS *Machine* COMPANY

WAYNESBORO • PENNSYLVANIA • U. S. A 414-C

4 Grinding Operations

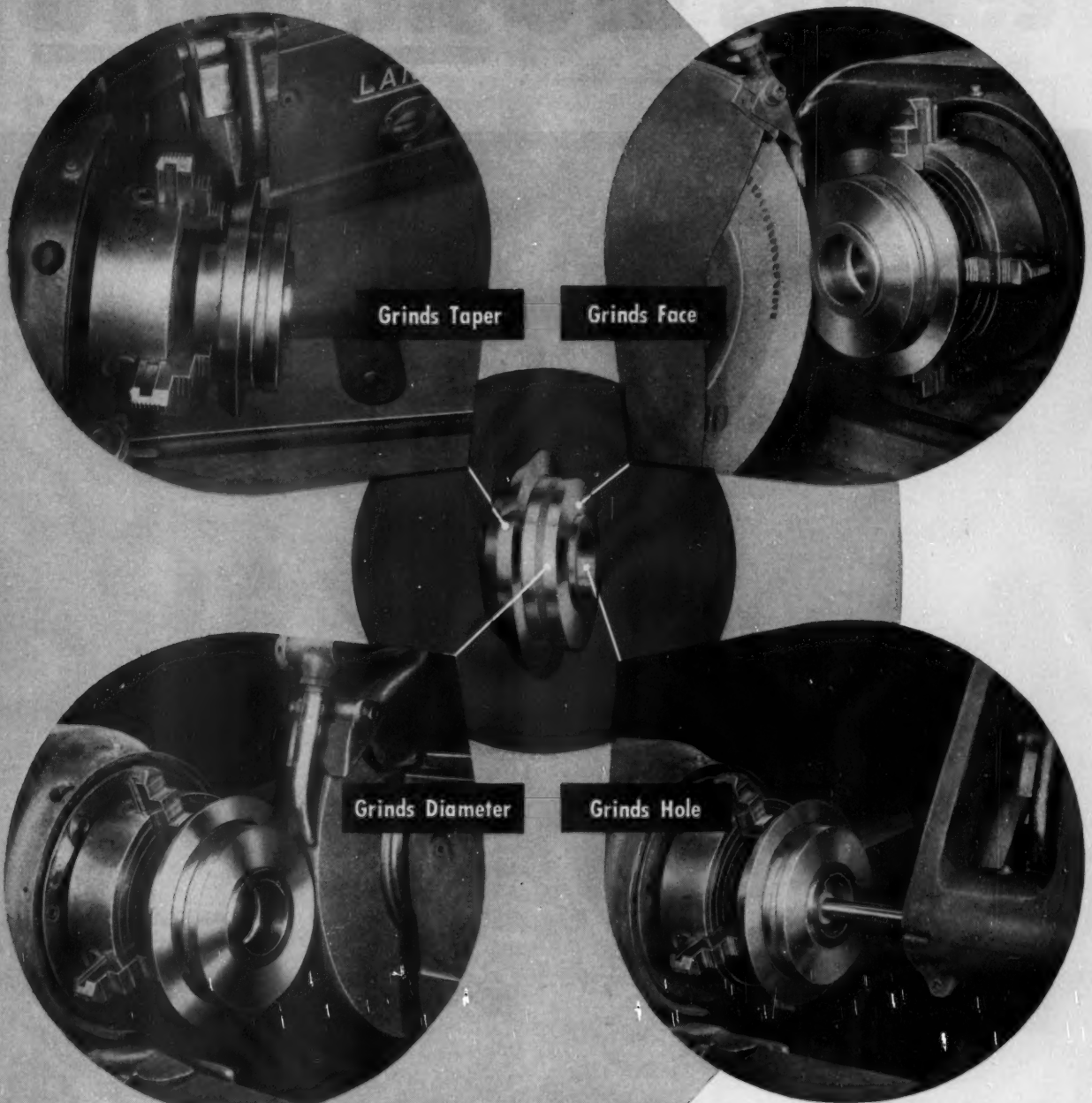
Versatility . . . an investment-saving advantage of Landis Universal Cylindrical Grinders

12" x 36" Landis Universal with swinging internal fixture and hydraulic rapid wheel head positioning.

LANDIS

precision grinders

in One Chucking



LANDIS TOOL COMPANY / WAYNESBORO, PENNA., U. S. A.

Flame-hardened and ways are standard

• Here, a skilled G&L craftsman, using G&L developed equipment, flame-hardens ways for a 30 Series machine. The greater hardness helps maintain the higher, longer-lived machining accuracy you get with G&L machines.

precision-ground on the G&L 30 Series

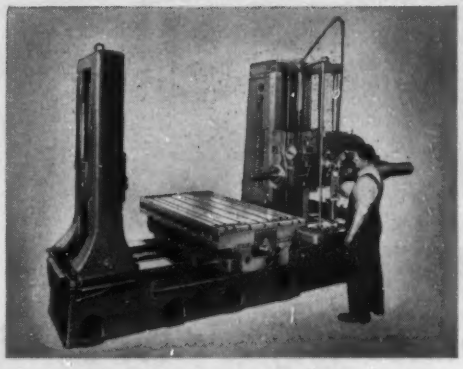
Hardened and ground bed and saddle ways are only one of the many plus features that are standard equipment on the G & L 30 Series table type Horizontals

IF you're searching for a horizontal boring, drilling and milling machine to handle large or small work, simple or complex set-ups, long or short runs — it will pay you to find out about the G&L 30 Series.

You'll discover that 30 Series machines allow you to perform boring, drilling and milling with equally high efficiency. You'll see, too, that no other machine on the market today offers you so many distinct performance and capacity boosting features as standard equipment.

Here are only a few of them — 45 all-geared spindle speeds in fine increments, 36 feeds, positive gear drive for heavier cuts, rapid change of feeds and speeds with full horsepower in the higher speed ranges.

Your investigation will convince you that a 30 Series machine is in a class by itself — often copied, never equaled. For complete details, see your G&L representative or write for the new 30 Series catalog.



There are two basic models in the 30 Series — the 340-T with 4" spindle and 20 hp, the 350-T with 5" spindle and 25 hp. Both machines offer a choice of three basic arrangements of table and saddle.

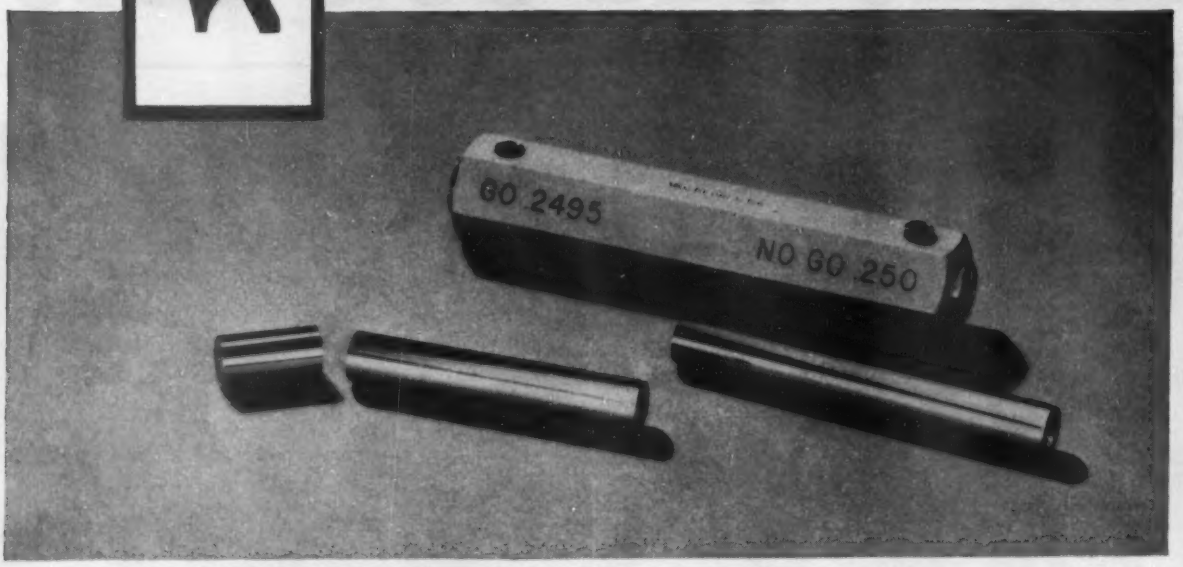
Hardened ways for bed and saddle are micro-finish ground, feature exceptionally accurate alignment.

GIDDINGS & LEWIS MACHINE TOOL CO.

FOND DU LAC, WISCONSIN

Builders of the world's finest heavy-duty machine tools — Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; Hypro Double Housing and Openside Planers; Planer Type Milling Machines and Vertical Boring Mills; and Davis Cutting Tools

VK WIRE TYPE PLUG GAGES



VASTLY LONGER-LIVED *and* MONEY-SAVERS . . .

because they're "Cut-Off-Able" as well as "Reversible"

As a Van Keuren agent put it, "They're not only reversible, they're cut-off-able." And that means when you buy Van Keuren Wire Type Plug Gages, the sizes below 3/16" may be cut off when ends become worn and as many as from five to ten gages made available from the 1 7/8" and 2" long units. It is not only economical and practical to use Van Keuren Gages but it is a very simple operation to cut off the ends by following instructions furnished on request. The illustration above shows clearly the cut-off and reversible features.

VK Wire Type Gages are available in ZZ to XX accuracies in sizes from .001" to 1.000". They are furnished in alloy tool steel, high speed steel, chromium plate or tungsten carbide. Whatever the gaging job, the extra length provided in VK units will save you money. It will also pay you to take advantage of VK deliveries. In many cases we can ship your requirements from stock.

VK Wire Type Plug Gages are fully described in Catalog & Hand Book No. 35, available on request by writing to: The Van Keuren Co., 173 Waltham St., Watertown, Mass.

VK

15th YEAR

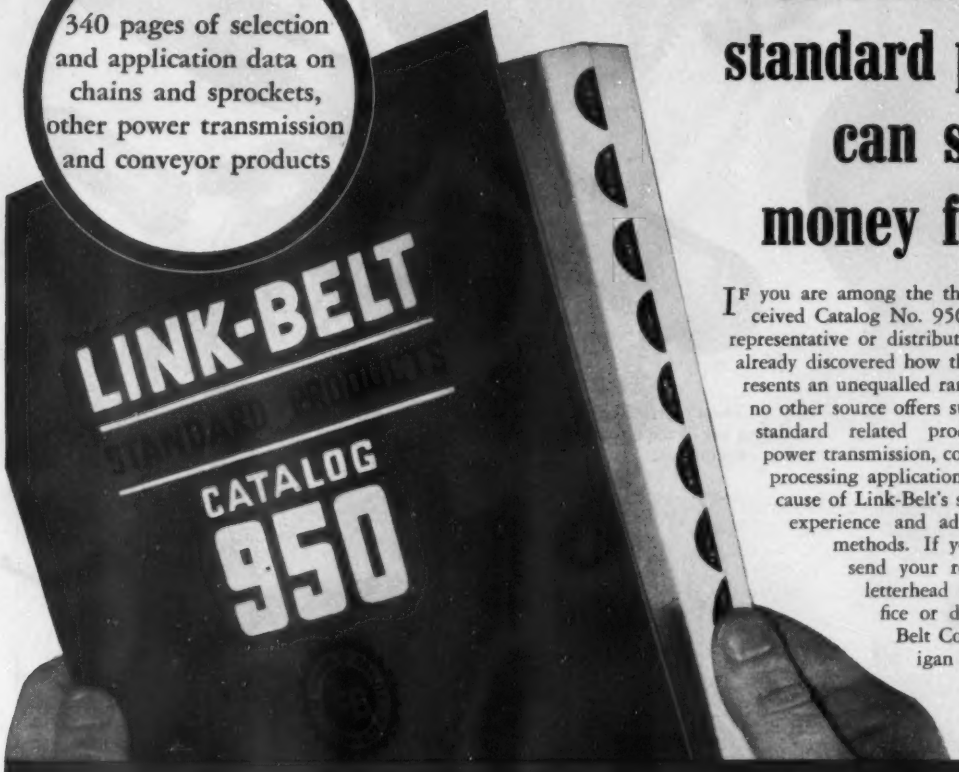
THE Van Keuren CO.,

173 WALTHAM STREET, WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires • Chrome Carbide Taper Insert Plug Gages

How this NEW catalog of LINK-BELT standard products can save money for you

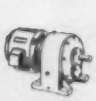
340 pages of selection and application data on chains and sprockets, other power transmission and conveyor products



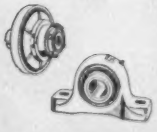
IF you are among the thousands who have received Catalog No. 950 from your Link-Belt representative or distributor, chances are you've already discovered how this "encyclopedia" represents an unequalled range of choice—because no other source offers such a complete line of standard related products for mechanical power transmission, conveying, elevating and processing applications. You profit, too, because of Link-Belt's specialized engineering experience and advanced manufacturing methods. If you don't have a copy, send your request on your firm's letterhead to your Link-Belt office or distributor or to Link-Belt Company, 307 N. Michigan Ave., Chicago 1, Ill.

Here's a single, easy-to-use source for all these quality products

Chains—cast, combination, forged and steel sidebar and attachments, with arm or plate center cast sprockets. *Precision steel roller chains and sprockets. Silent chains and sprockets.* Castings, tighteners, wing and swivel attachments.



Enclosed drives—P.I.V. variable speed and fluid drives, gearmotors and motogears, parallel shaft and worm gear drives.



Bearings—ball, roller, babbitted and bronze. *Rigid and flexible couplings.* Take-ups, hangers, bushings, pulleys, gears, clutches, backstops, shear pin hubs, collars, grease cups.

Processing equipment—vibrating screens, icing equipment.

Conveyors—Flexmount oscillating and piano-hinged apron. *Components* for screw, belt and trolley conveyors. *Car spotters and pullers. Power unloading scoops. Bucket elevators and elevator buckets.*

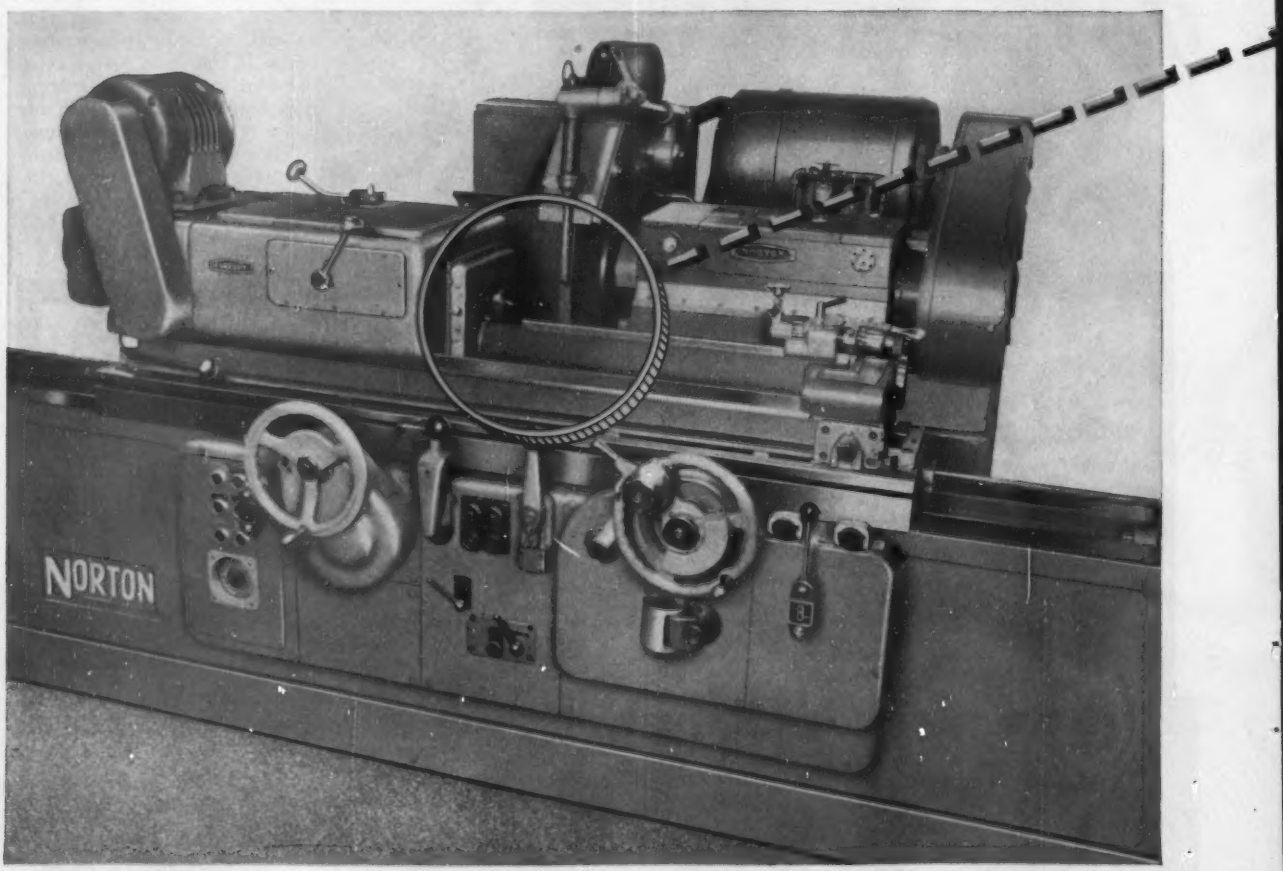
Other products—cast and cut tooth sprocket wheels, taper lock bushings, spray nozzles, gates, cutoff valves, winches.

LINK-BELT

One source . . . one responsibility for materials handling and power transmission machinery

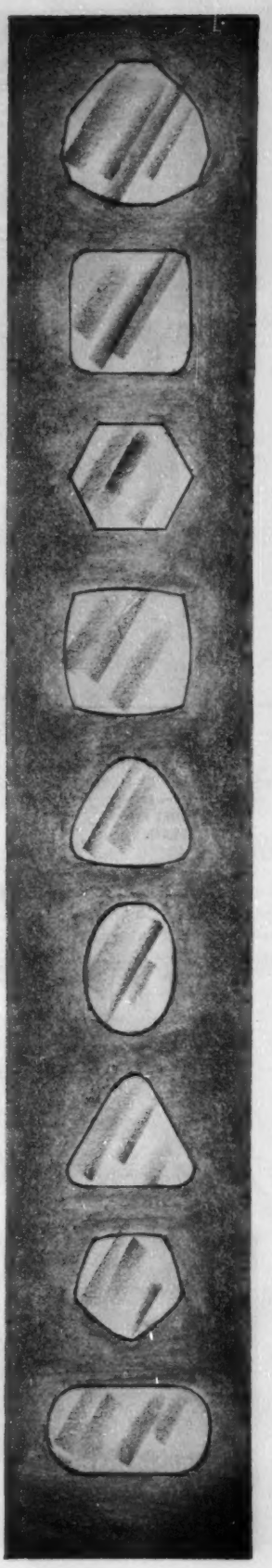
LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office: New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World. 13.050

These representative types of tri-lobe shafts, shown with mating parts, are only a few of the many different shapes you can produce on Norton cam grinding equipment.



A Norton 5" x 24" Type CTU semiautomatic production Cam Grinder for maximum speed, economy and versatility.

For grinding drive shafts to any shape



here's the equipment you need

Norton cam grinding equipment produces endless variations of triangular, square, oval or many-sided forms—accurately and economically

If you are now grinding tri-lobe or other forms of drive shafts, or are planning to grind such shafts, it will pay you to investigate Norton cam grinding equipment.

Norton Cam Grinders are available in varying work capacities. They are designed for rapidly grinding shafts to the exact form you need, to the tolerance you must hold, and with the fast, trouble-free operation that means lower production costs.

Shapes you can produce are not confined to arcs, but include curves and tangent flats in combination. Broaches for producing the mating holes can also be accurately ground on this same equipment.

Call on Norton cam engineers for expert help in the design and production of shaft forms that will best meet your needs. Or send for Catalog 2053, containing further facts on cam and shape grinding equipment. And remember: only Norton offers you such long experience in both grinding wheels and machines to help you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Mass. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.

To Economize, Modernize With NEW

NORTON

GRINDERS and LAPPERS

Making better products... to make other products better

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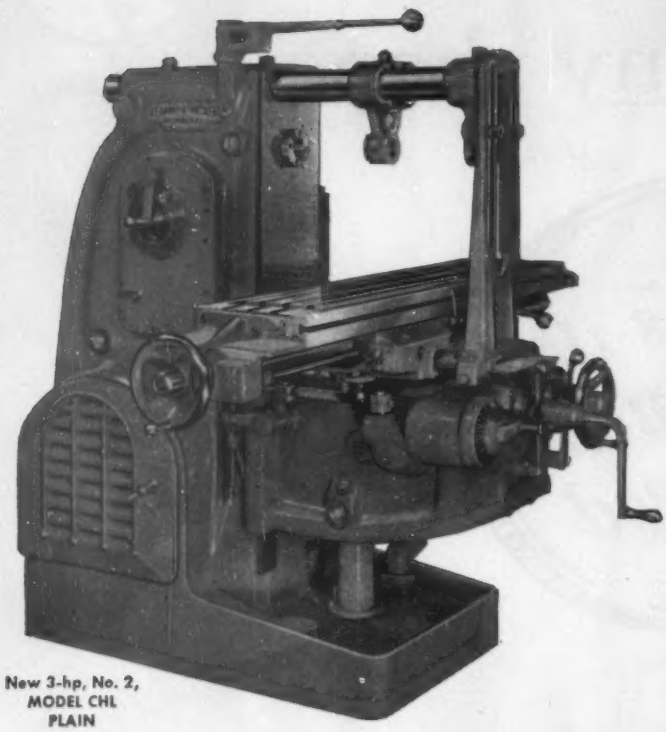
LESS THAN 23 CENTS PER HOUR



New 3-hp, No. 2, MODEL CHL PLAIN

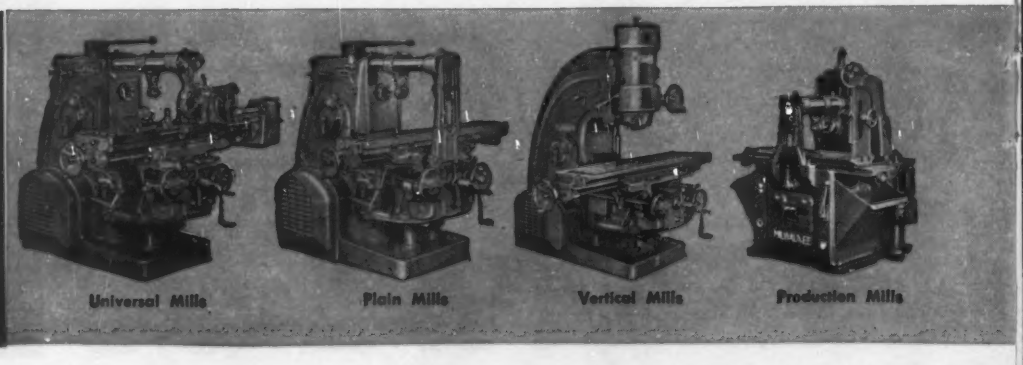
...will put this new 3-hp, No. 2, Model CHL plain milling machine to work in your plant with...

Kearney & Trecker's

TOOL-LEASE

PROGRAM

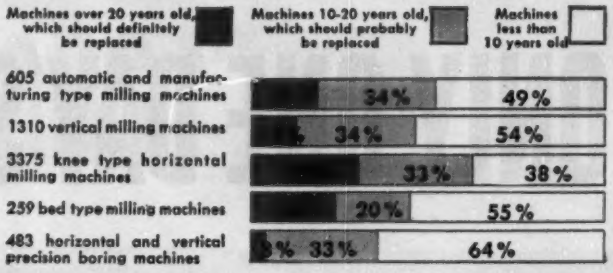
Kearney & Trecker manufactures a complete line of more than 250 standard knee and bed type milling machines and precision boring machines.



Universal Mills | Plain Mills | Vertical Mills | Production Mills

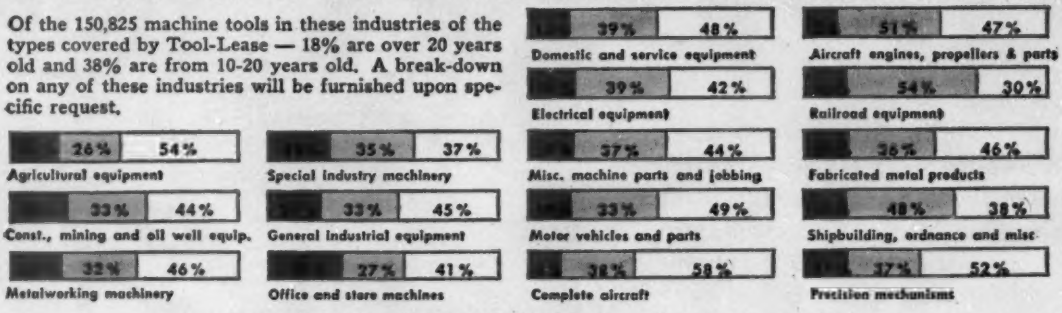
LET'S LOOK AT THE OBSOLESCENCE PICTURE IN THE GENERAL INDUSTRIAL EQUIPMENT INDUSTRY

Here's the picture in a typical industry — GENERAL INDUSTRIAL EQUIPMENT — (see chart at right). Of the 6032 standard knee type horizontal, vertical, bed and manufacturing type milling machines and precision boring machines in use today — which can be replaced by Tool-Lease equipment — 22% are more than 20 years old, 33% are 10 to 20 years old, 55% are more than 10 years old!



HERE'S THE OVERALL PICTURE IN THE ABOVE AND 15 OTHER BASIC INDUSTRIES

Of the 150,825 machine tools in these industries of the types covered by Tool-Lease — 18% are over 20 years old and 38% are from 10-20 years old. A break-down on any of these industries will be furnished upon specific request.



Figures adapted from 1953 American Machinist survey of metalworking industry

NO! We didn't make a mistake. Under Tool-Lease Plan "A", one of three seven-year lease agreements offered by Kearney & Trecker, you are asked to make two semi-annual rental payments, totaling 25% of the machine's price during each of the first three years. Actually, in dollars and cents, you are asked to invest approximately 23 cents per hour for a new 3-hp, No. 2, Model CHL plain milling machine. That means a machine installed in your plant and in operation — *for pennies an hour!*

What's more, under Tool-Lease, you can rent any of over 250 standard milling machines or precision boring machines. All are available under three basic plans, with varying options to continue or terminate the lease, or to purchase the equipment. If you require special machinery or heavy-duty CSM bed types, special agreements will be considered.

GET ALL THE FACTS NOW!

For complete information on Tool-Lease . . . help in analyzing your milling and/or precision boring needs — see your Kearney & Trecker representative or mail coupon to Kearney & Trecker Corp., 6784 W. National Avenue, Milwaukee 14, Wisconsin.

TOOL LEASE
KEARNEY & TRECKER
MILWAUKEE
MACHINE TOOLS
EQUIPMENT ®

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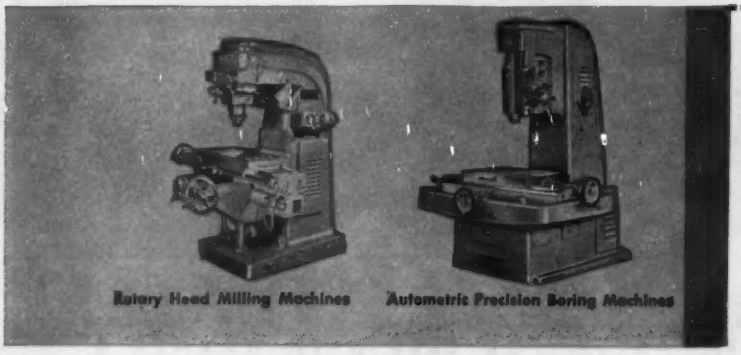
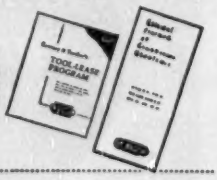


KEARNEY & TRECKER CORP.
6784 W. National Avenue
Milwaukee 14, Wisconsin

Please send me Bulletin TL-10A on Tool-Lease Program and booklet titled "Critical Picture of Creeping Obsolescence" or call Milwaukee, GReenfield 6-8300.



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Title.....

Company.....

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City..... Zone..... State.....

Warner & Swasey's record

"ONLY ONE DAY'S DOWNTIME

THAT'S the report on two Warner & Swasey No. 3 Universal Turret Lathes at the Ralston, Nebraska, plant of Sensation Mower, Inc. And since their installation in 1946 these two highly versatile turret lathes have efficiently handled the entire metal turning requirements of the plant—over 40 different parts for mowers, snow removal equipment, and power floor polishers.

Mr. W. H. Phelps, Sensation Mower's President, says, "We are able to get the job done with these machines a lot faster than even your Field Engineer said we could."

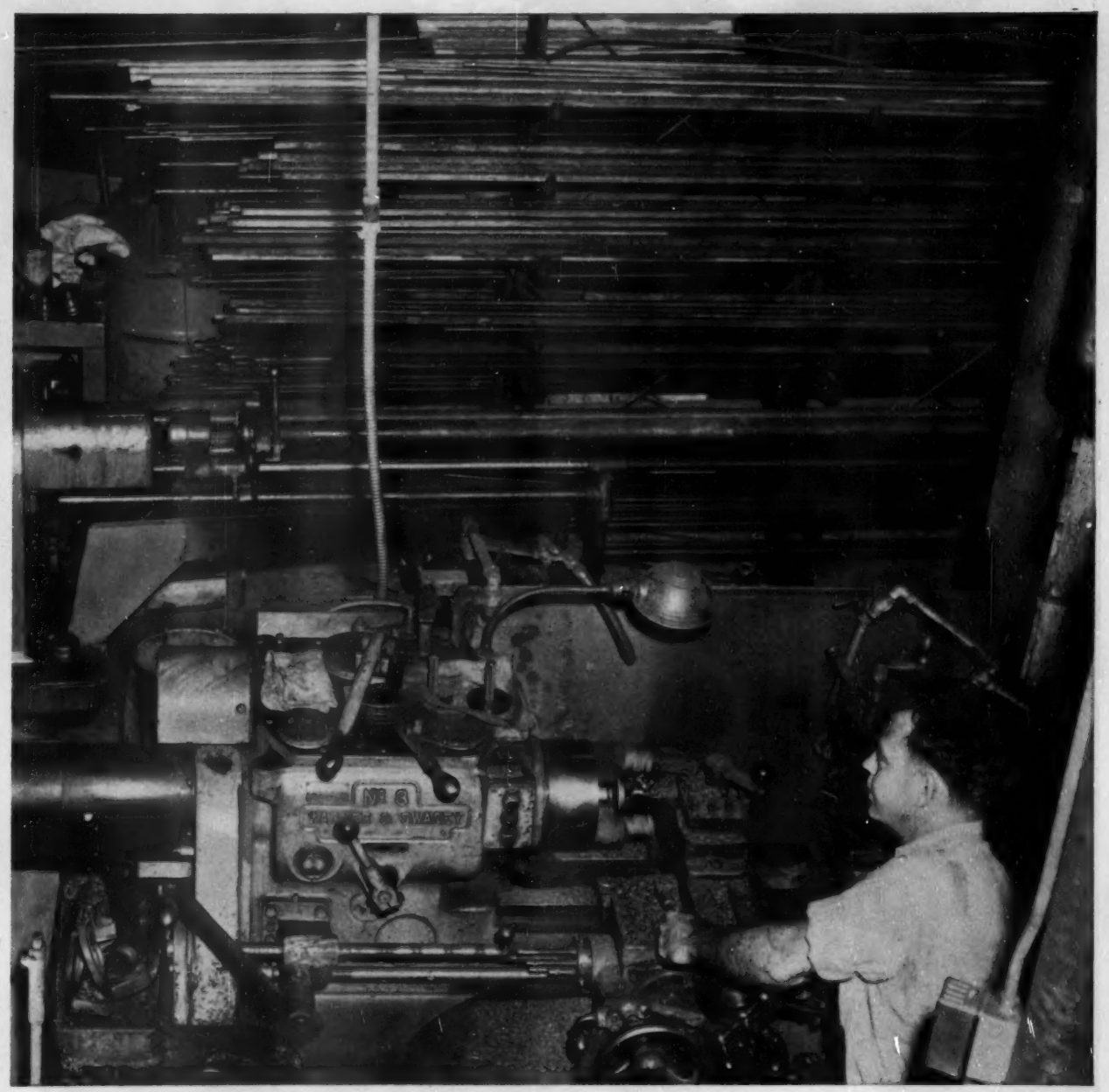
Yes, Warner & Swaseys are built to last—to give you dependable, high precision production with the very minimum of downtime and maintenance costs.

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS WITH WARNER &

at Sensation Mower, Inc.

IN SEVEN YEARS!"



SWASEY MACHINE TOOLS, TEXTILE MACHINERY, CONSTRUCTION MACHINERY

His
"6th Sense"
is mostly
good
business sense
MORSE
Franchised
Distributor

. . . another good reason why it pays to depend on your

MORSE - FRANCHISED DISTRIBUTOR

It's his good business sense that helps your Morse-Franchised Distributor to anticipate your wants — and keeps him constantly on the alert for those products you might need.

This foresightedness is an invaluable protection for you in your supply problems . . . just as the Morse Line is top protection for your cutting-tool dollar. On any job, Morse can give you the most for your money . . . and your Morse-Franchised Distributor is always right on deck to see that you get it. So for drills, taps, dies, reamers, end mills and cutters . . . plain or Electrolized . . . *depend* on your Morse-Franchised Distributor.

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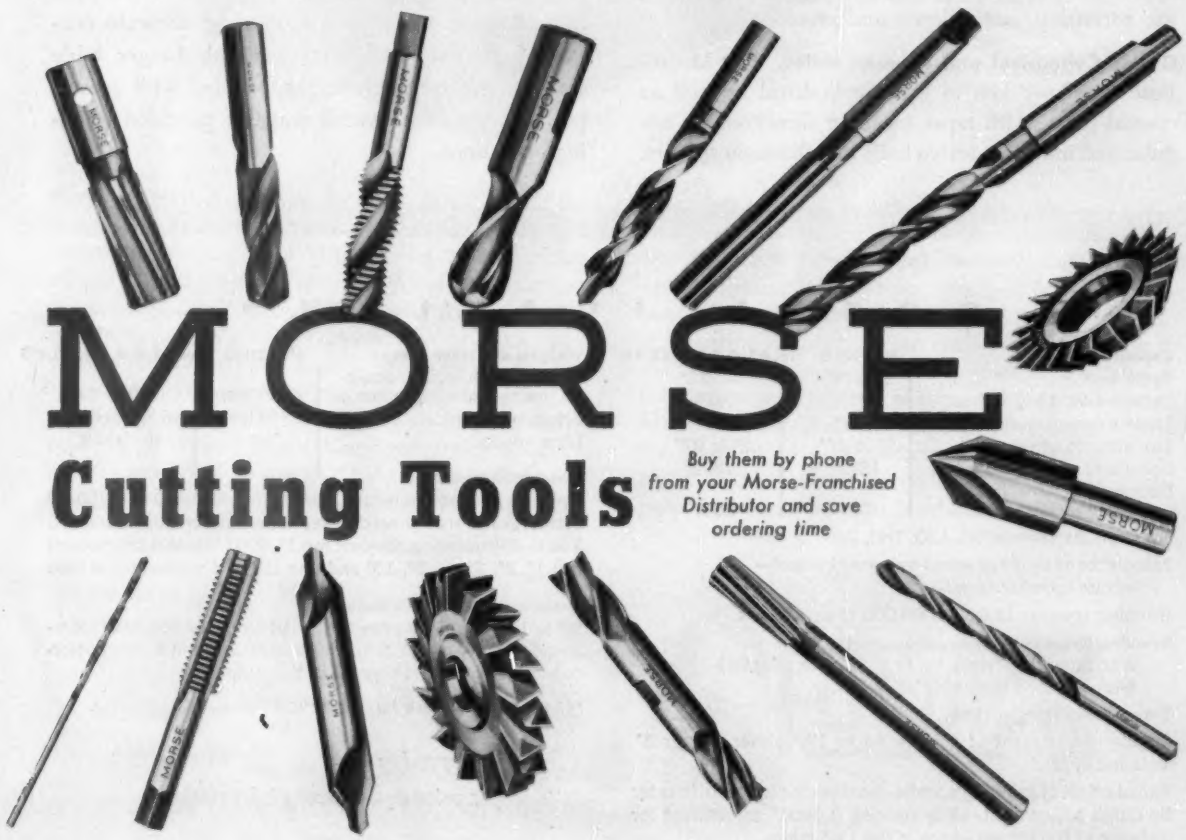
(Division of VAN NORMAN COMPANY)

NEW BEDFORD, MASS. · Warehouses in New York, Detroit, Chicago, Houston, San Francisco



MORSE Cutting Tools

Buy them by phone from your Morse-Franchised Distributor and save ordering time

Announcing the Moore-Fosdick

The only machine of its kind in

• Greater range—22" x 42" x 27" height • Automatically positions work to ±.0001"

• Grinds jigs, dies, punches, templates and machine parts • Infinite Grinding Speeds—12,000 to 60,000 rpm • Contour and Chop Grinding • Slot Grinding Attachment • Spindle-Housing Heat Control

This new machine combines the unique Moore Jig Grinding Head with the exclusive Fosdick Automatic Positioning Table. It gives you greater capacity for precision grinding with the speed and convenience of a table that automatically positions work to ± .0001". *There is no other machine in the world that even approaches the Moore-Fosdick in jig-grinding capacity, versatility, convenience and precision!*

Grinds Cylindrical and Tapered Holes. The Moore-Fosdick allows you to grind cylindrical as well as conical holes, with taper in either direction. An angular and indexing device built into the main spindle, and the newly developed slot grinding attachment, permit the quick, accurate grinding of any contour—*regular* or *irregular*.

Large Work Capacity—Infinite Number of Speeds. The Moore-Fosdick A. P. Jig Grinder has an infinite range of grinding speeds – from 12,000 to 60,000 rpm . . . allowing extreme versatility and accurate control of grinding and stock removal. Larger table size and greater work height, coupled with greater power, *extend* the overall range of precision grinding operations.

S P E C I F I C A T I O N S

Capacity:	No. 30-G	No. 42-G & No. 42-PG*
Table size	36"x18"	44"x22"
Table travel, Longitudinal	30"	42"
Table travel, Crosswise	17½"	22"
Table top to wheel collet	2" to 27"	2" to 27"
Spindle to column ways	18½"	18½"
Spindle to column below ways	20"	25¼"

Four spindle speeds: 90, 120, 180, 240

Spindle feeds by air-powered hydraulic control—infinite speed control

Grinding speeds: 12,000 to 60,000 rpm; 3 heads

Grinding Capacity:
With grinding wheels, ⅜" to 5" (8" with adapter)
With diamond mandrels ¼" to ⅜"

Travel main spindle slide... 3⅛"

Angular adjustment of spindle up to 1½° either way or 3° included angle.

Radial offset of grinding spindle-from center to 1⅛" off center by rough adjustment-while running 0.0001" adjustment for distance of 0.075" anywhere in the 1⅛" range.

Weights and Floor Space:	No. 30-G	No. 42-G & No. 42-PG
Machine with regular equipment, including motor	6000 lbs.	11,000 lbs.
Shipping weight	6750 lbs.	12,000 lbs.
Floor space	77"x82"	102"x128"

Standard Equipment:
Four-speed constant torque ¼ hp motor, 220-440 volts, 50-60 cycles, 2-3 phase, wheel dresser—micrometer stop-wrenches. Two built-in locating devices: two 1" .0001 inside micrometers; two 1", 2", 3", 4", 5", 10" and one 15" end measurers in box.

Compressed Air Requirements:
90 to 100 lbs. @ 15 cfm, furnished by customer. We recommend a heavy-duty 7.5 hp air compressor with a water aftercooler, provided it is capable of this output.

*42-PG Moore-Fosdick Jig Grinder with Automatic Positioning.

Write today
for price and delivery information.

Jig Grinder

the world!

Grinding Wheel Outfeed, Reads .0001", Adjustable while running
Cross Power Traverse Safety Switch and Positioning Control
Vertical Slide Taper Setting
Positive Adjustable Depth Stop, Micro Setting
Depth Measuring Dial Reads to .001"
Heating Elements for Continuous Temperature Control of Spindle Housing
Grinding Wheel Outfeed Slide, Course Adjustment
Longitudinal Power Traverse Safety Switch and Positioning Control
Measuring Rods or Duplicating Bars
Push Buttons to Control Table and Slide Rapid Traverse and Positioning of Table and Slide
MOORE-FOSDICK

Positions Work Automatically to ± .0001". With the Automatic Positioning Table, you can get fast and accurate positioning of parts to be ground. Two simple duplicating bars may be prepared to position work automatically to ± .0001" — at the touch of a pushbutton. This means that complex grinding jobs with hundreds of holes require only one set-up. On "one-time" jobs, measuring rods can be used in place of bars. For precision production jobs, the easily-made, easily-stored duplicating bars give you a permanent record of positions. Once a job is run, you store the bars and use them every time you rerun that same job — weeks, months or years later.

Grinder Head Dimensional Stability. Latest design of the grinding head incorporates new features to improve further its stability. These include: (1) Electric heating elements in the main spindle housing to maintain uniform temperature whether machine is running or not; (2) An observation thermometer so located as to indicate any temperature change within the housing; (3) The housing itself is cast from 36% nickel iron to reduce the effect of any possible temperature variation to an irreducible minimum.

Need Drilling Equipment? Get a Proposal from Fosdick!

Radial Drills

Jig Borers

Sensitive and Upright Drills

Sensitive Radial Drills

Automatic Positioning Machines

FOSDICK

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

smooth, direct parts flow

for short or long runs

Because of its superior ability to take off center die loads, the Henry & Wright Dieing Machine widens the ways in which you can use the economies of progressive stamping. Add to this basic advantage the accessibility of the H & W Dieing Machine for quick die changes.

Now tie the two together and you have a high speed, low cost production method that affords the maximum degree of flexibility in tooling. Jobs can be completed according to the toughest schedules. Short runs can be mixed with long runs. Assembly tooling can be readily incorporated. Your planning becomes a direct and simple matter of figuring so many completed parts per minute or hour per machine.

Most important, too: you cut your stamping costs below your best expectations and you improve parts quality.

Get the facts about H & W Dieing Machines by writing to Henry & Wright, 481 Windsor Street, Hartford, Conn., for Catalog 54.

HENRY & WRIGHT

DIVISION OF EMHART MFG. CO.

HARTFORD, CONNECTICUT

Gardner Cylinder Wheels

Give Maximum Safety . . . Lower Costs

WIRE-LOKT®
Construction

122A

GARDNER MACHINE COMPANY
410 Gardner St., Beloit, Wisconsin, U.S.A.

GARDNER

abrasive discs

WHY IT PAYS TO BUY MX SCREW STOCK FROM US

You get reduced production costs—quick delivery

● Hundreds of shop cases have shown that USS "MX" free-machining bar stock cuts unit costs considerably . . . an average of 10% to 15%, sometimes as high as 42%. And the more machine work your parts require, the greater the savings.

Here's how you cut costs when you use "MX" rather than other free-machining grades:

You get more parts per hour, longer tool life with less down time for grinding and adjustment, fewer rejects, closer tolerances and better part finish.

One of our qualified sales representatives will gladly discuss the advantages of "MX" with you as they apply to your particular shop requirements. And you can always depend upon quick delivery from the nearest U.S. Steel Supply warehouse.

In addition to "MX" stock, we carry: cold finished rounds, squares, hexagons, flats and precision shafting in all grades.

TRIPLE SECURITY

What you want
When you want it
At the **right price**

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USS STEEL
UNITED STATES STEEL

UNITED STATES STEEL

New Norton Cut-Off Wheels Get Industry's O.K.!

Reports from every section of the country tell how the freer cutting, longer lasting R50 and B9 add the profit-boosting "TOUCH of GOLD"

Here's what they say about—

The R50

143 more cuts
California mine bit manufacturer rates R50 rubber cut-off wheel best ever used. Gave 735 cuts to competitive wheel's 592, for 24% more wheel life.

Better performance
Connecticut machine tool manufacturer says R50 wheel outperformed competitive wheel, cutting freer on wet cutting of high carbon tool steel. (see photo)

120% longer life
Indiana construction equipment manufacturer reports R50 wheel produced 216 cuts, 120% more than competitive wheel's 98 cuts.

No burn or breakage
Kentucky manufacturer of garbage disposal units found R50 wheels eliminated the breakage problem and produced a cut free of burr and burn.

450 more cuts
Missouri manufacturer of coal mining equipment used an R50 wheel to cut 12 bars at 90 cuts per bar, totalling 1080 cuts. Beat best previous wheel's record of 7 bars, 630 cuts, by 70%.

Freer cutting, longer lasting
Massachusetts manufacturer of pneumatic tools reports R50 wheel 25% more durable while producing an equal quality of cut. Freer cutting, with less of usual rubber wheel odor.

25% more cuts
Connecticut machine manufacturer reports R50 wheel produced 25% more cuts than competitive wheels, with equal freeness and cleanness of cut.

The B9

72% more durable
Michigan engine manufacturer says B9 wheel produced 250 cuts over competition's 145, lasting 72% longer.

Lasted three times longer
Ohio metal working company reports B9 gave three times the service life of competitive wheel, with excellent cutting performance.

40% more cuts
Pennsylvania die manufacturer found B9 wheel outproduced competitive wheel by 40% giving 252 cuts as against 180.

36% production increase
Missouri metal company tells how B9 gave 75 cuts to competition's 50-55, proving 36% longer lasting.

Wheel life doubled
New York manufacturer cutting tubing and bars says B9 wheel with F sides lasted twice as long as previous wheel and cut a wide range of metals. (see photo)

150% over competition
Maryland metal working company says B9 wheel gave 125 cuts, topping competitive wheel's 50 cuts by 150%.

42% more cuts
Pennsylvania construction equipment manufacturer averaged 125 cuts with B9 wheel, 42% over competitive wheel's average of 88 cuts.

85% longer life
California forge and pipe foundry reports B9 lasted 85% longer than any other wheel.

27% more durable
Ohio aircraft manufacturer, cutting a wide variety of bar stock, says B9 wheel delivered 27% longer life than competitive wheels.

Performance reports like these are coming in every day, telling how the new Norton R50 and B9 cut-off wheels are setting new records for extra long service life and improved cutting action. Check them carefully, then judge for yourself how much your own cutting-off operations will benefit by these outstanding wheels. And remember: for every cut-off job you do, there's a Norton cut-off wheel that will add the money-saving "Touch of Gold".

See Your Norton Distributor for the cut-off wheels you need. Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your classified phone directory. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

The New Norton R50 rubber bonded cut-off wheel is designed especially for wet-cutting of ferrous or non-ferrous bar stock up to 6" diameter. Built-in chip clearance — a great advancement in this type of wheel — is one of its special "Touch of Gold" advantages that assure freer, faster cutting with maximum strength and service life.

The New Norton B9 resinoid bonded cut-off wheel is made with either smooth sides or with the rough "F" sides for more clearance in the cut. It is a high production wheel, cutting free and cool with minimum burning. It will give you long, economical "Touch of Gold" performance in the widest range of ferrous and non-ferrous applications. W-1570

NORTON

and its BEHR-MANNING division

NORTON: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

Making better products ... to make other products better

MORE YEARS OF BETTER SERVICE

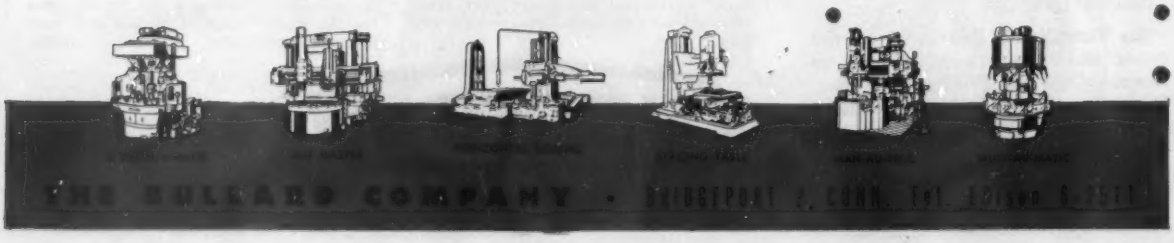
at Low Cost

BULLARD

At Phillips Machine Shop in Alliance, Ohio, they rely on Bullard Horizontal Boring, Milling and Drilling Machines. They do general machine work for a number of major manufacturers in this highly industrialized northern Ohio area.

"I choose Bullard," says Mr. Donald Phillips, owner, "because it is the best boring mill on the market. I have carefully checked other domestic and foreign makes. None of them have the weight, the solidity and the reliability of the Bullard machine."

Investigate BULLARD — if you're looking for a versatile, rugged horizontal boring, milling and drilling machine with "built-in" accuracy and efficiency. Have your Bullard representative explain its many features or write to



THE BULLARD COMPANY · BRIDGEPORT 2, CONN.

ONE AFTER ANOTHER

For years considered *the best* in a limited territory, AMPCO quality Drills and Reamers are now becoming favorites in an ever widening circle of friends. Now, from coast to coast, GTD-AMPCO Drills and Reamers are proving that what was long good in one section of American Industry is good the country over.

Yes, one drilling or reaming job after another is going GTD-AMPCO.

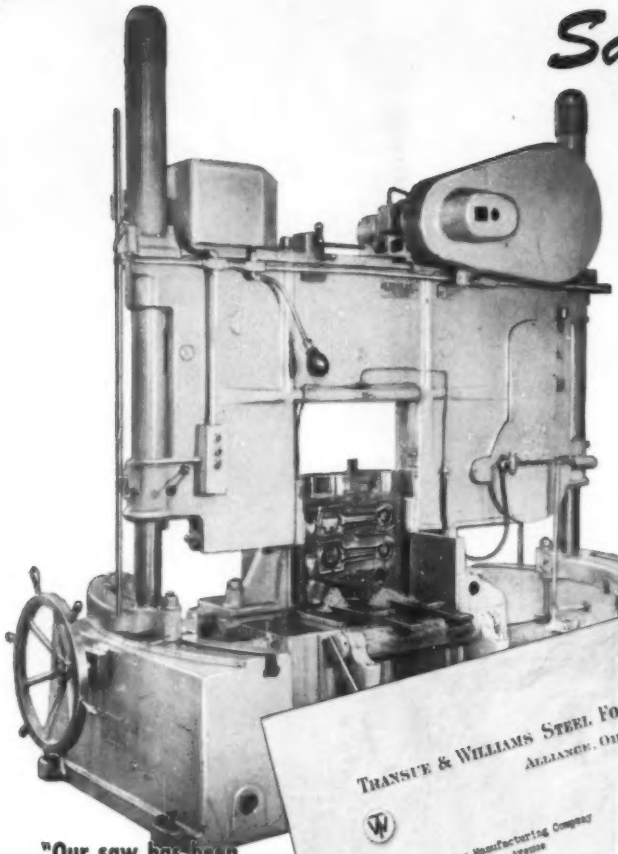
Get the best, specify GTD-AMPCO.

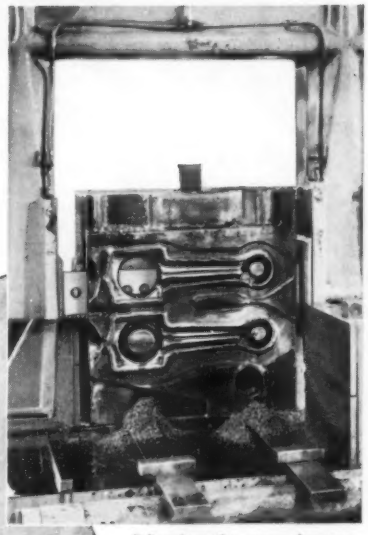
AMPCO TWIST DRILL DIVISION

GREENFIELD TAP AND DIE CORPORATION

GREENFIELD, MASS.

Save 25% Time in Re-facing Dies... 20% Time -plus steel- in Shanking Them





Trimming the worn impression from the face of a 20" x 24" die block with a No. 24 MARVEL Universal Hydraulic Roll Stroke Hack Sawing Machine. Average Blade Cost $.0108 per square inch.

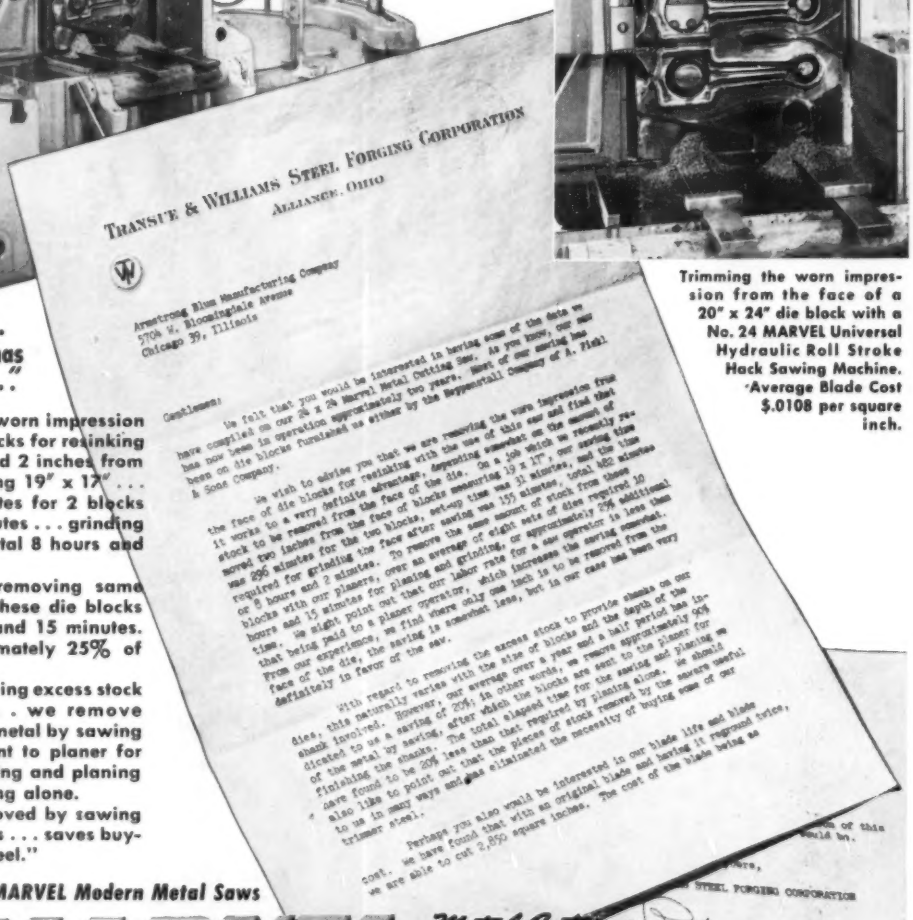
"Our saw has been in operation 2 years. Most of our sawing has been on die blocks..."

"We are removing the worn impression from the face of die blocks for resinking ... we recently removed 2 inches from face of blocks measuring 19" x 17" ... sawing time 296 minutes for 2 blocks ... Set up time 31 minutes ... grinding time 155 minutes ... total 8 hours and 2 minutes.

"Average time for removing same amount of stock from these die blocks with planer, 10 hours and 15 minutes. Sawing saves approximately 25% of time ...

"With regard to removing excess stock to provide shanks ... we remove approximately 90% of metal by sawing after which block is sent to planer for finishing. Time for sawing and planing is 20% less than planing alone.

"Pieces of stock removed by sawing are useful in many ways ... saves buying of some trimmer steel."



TRANSUE & WILLIAMS STEEL FORGING CORPORATION
ALLIANCE, OHIO

Armstrong Blum Manufacturing Company
5704 W. Bloomingdale Avenue
Chicago 39, Illinois

Gentlemen:

In fair that you would be interested in having some of the data we have compiled on our 24 x 24 Marvel Metal Cutting saw. As you know, our saw has now been in operation approximately two years. Most of our sawing has been on die blocks furnished us either by the Heppenstall Company of A. Finkl & Sons Company.

We wish to advise you that we are removing the worn impression from the face of die blocks for resinking with the use of this saw and find that it works to a very definite advantage, depending somewhat on the amount of stock to be removed from the face of the die. On a job which we recently re-served two inches for the two blocks, set-up time was 31 minutes, and the time was 296 minutes for grinding the face after sawing was 155 minutes, total 482 minutes required for grinding and 2 minutes. To remove the same amount of stock from these or 8 hours and 2 minutes, over an average of eight sets of dies required 10 blocks with our planer, operator, which increases the sawing somewhat. hours and 15 minutes for that our labor rate for a saw operator is less than time. We might point out that being paid to a planer operator, that being said to removing the excess stock to provide shanks on our From our experience, we find there only one inch is to be removed from the face of the die, the saving is somewhat less, but in our case has been very definately in favor of the saw.

With regard to removing the excess stock to provide shanks on our dies, this naturally varies with the size of blocks and the depth of the shank involved. However, our average over a year and a half period has indicated to us a saving of 20%; in other words, we remove approximately 90% of the metal by sawing, after which the blocks are sent to the planer for finishing the shanks. The total elapsed time for the sawing and planing we have found to be 20% less than that required by planing alone. We should also like to point out that the pieces of stock removed by the sawers useful to us in many ways and has eliminated the necessity of buying some of our trimmer steel.

Perhaps you also would be interested in our blade life and blade cost. We have found that with an original blade and having it reground twice, we are able to cut 2,850 square inches. The cost of the blade being as

...of this ...ould be.

...ers,

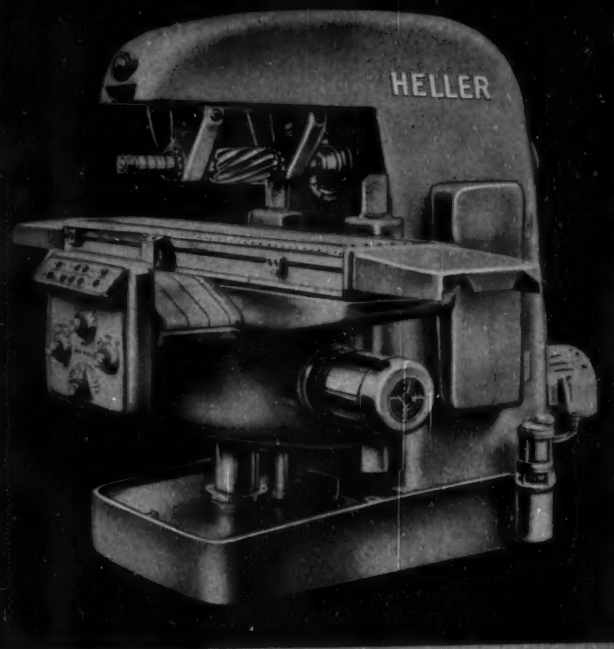
...STEEL FORGING CORPORATION

...Factory Manager

Write for Catalog of MARVEL Modern Metal Saws

MARVEL *Metal Cutting* **SAWS**
Better Machines–Better Blades

ARMSTRONG-BLUM MFG. CO. 5700 W. BLOOMINGDALE AVE. CHICAGO, (39) U. S. A.



Cut Costs and Increase Efficiency with

HELLER

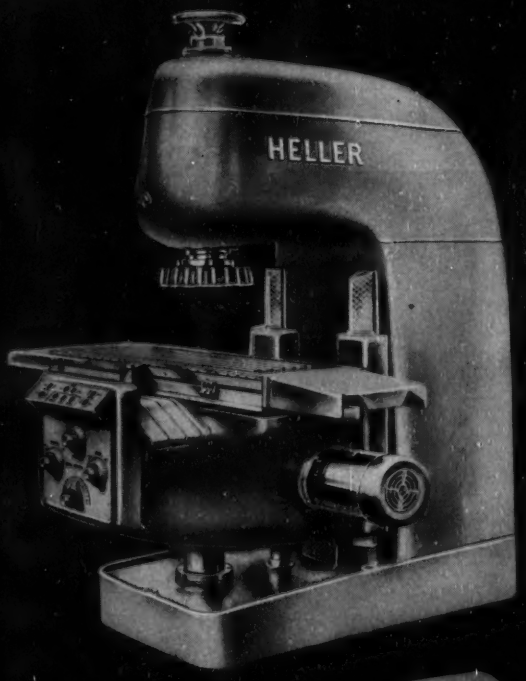
PRODUCTION MILLING MACHINES

HELLER knee type milling machines are available in either horizontal or vertical construction for use with carbide cutters for heavy milling work.

They are rigidly built for the heaviest production milling with powerful drive units with 18 speeds to a roller bearinged spindle.

The control is through push button selection and machines can be furnished standard or equipped with full automatic cycling control or with copy milling control through electro-hydraulic feeler.

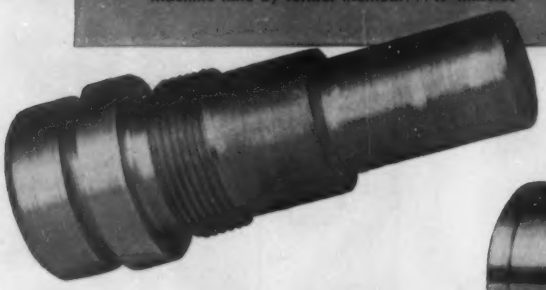
Importing Heller Machines Since 1926



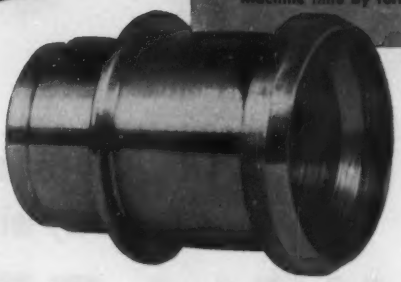
DRILLING MACHINES · COLD-SAW MACHINES · SAW SHARPENING MACHINES · TRANSFER AND SPECIAL MACHINES · KNEE TYPE MILLING MACHINES · PLANER TYPE MILLING MACHINES

HELLER MACHINE CO., 114 Liberty St., New York 6, N. Y.

JOB FACTS:
Part: . . . . . Pilot Stud—1⅝ x 6" long
Material: . . . . . A-4615 CR Steel
Machine time on Model M: . . . . . 7½ minutes
Machine time by former method: . . 17 minutes



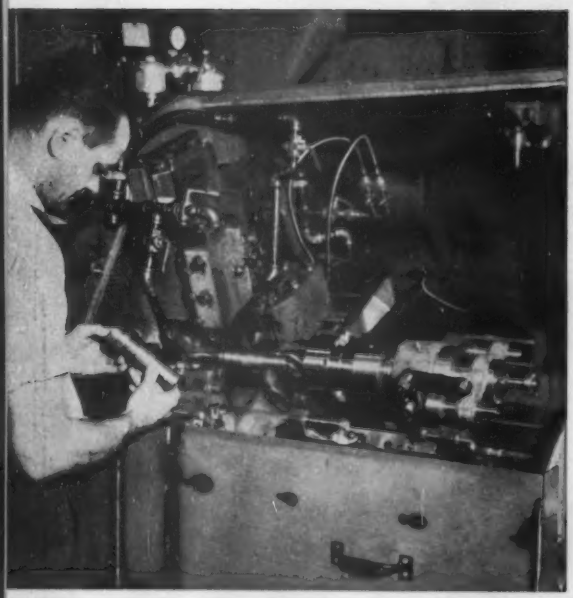
JOB FACTS:
Part: . . . . . Whirl—3½ x 4⅞" long
Material: . . . . . Leaded Open Hearth Steel
Machine time on Model M: . . . . . 5¾ minutes
Machine time by former method: . . 21 minutes



here's why it takes

more than just speed

to keep production on schedule

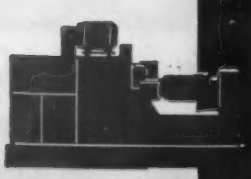


It's one thing to be able to machine a steel part at the fastest practical speeds and feeds. But speed without dependable control is wasted. You get both speed and control with MODEL M SINGLE SPINDLE AUTOMATICS.

Take the parts shown. In both cases, the completed pieces are machined automatically at their same predetermined rate every time, without interruption. In the long stud there are 11 operations including threading—the piece is completed on the Model M in less than half the time of the former method. In the other piece (with a large hole partway and a small one the rest of the way) spindle speeds are changed automatically during the cycle to provide the best speeds and feeds for different diameter cuts—and the time for a finished piece is less than ⅓ that of the former method.

Why not get all the facts? Write for Catalog M-50A. Or, better still, ask our engineers to talk with yours about your production jobs—long or short run.

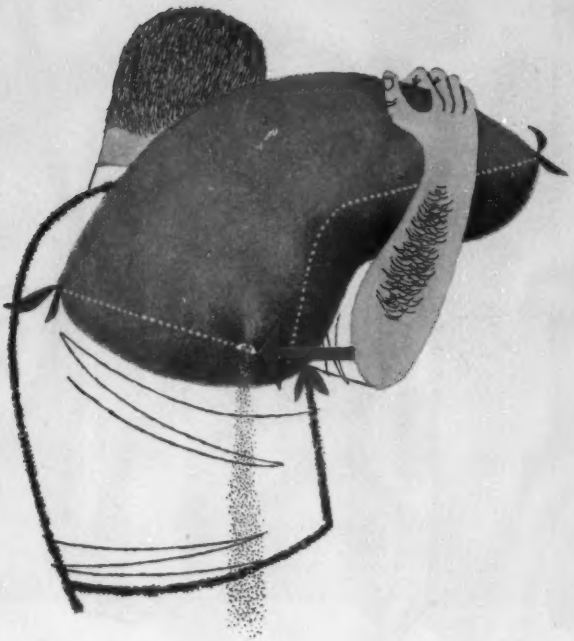
Nothing can so completely destroy profits as the continued use of obsolete equipment.



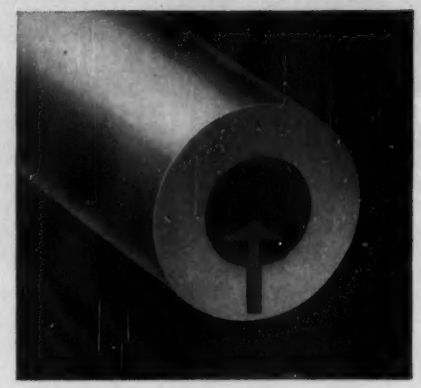
The NATIONAL ACME COMPANY

170 EAST 131st STREET • CLEVELAND 8, OHIO

ACME-GRIDLEY BAR and CHUCKING AUTOMATICS
1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • Limit, Motor Starter and Control Station Switches • Solenoids • Contract Manufacturing.



a hole here makes waste...



a hole here makes a saving

Crucible Hollow Tool Steel Bars **are a boon to the metalworking industry. The hole in these quality bars enable toolmakers to eliminate drilling, boring, cutting-off and rough-facing operations. This cuts production time, boosts machine capacity and saves scrap losses.**

They are available now, in any of Crucible's famous tool steel grades, in almost any combination of O.D. and I.D. sizes. And you can get *immediate* delivery of five popular grades — KETOS oil-hardening, SANDERSON water-hardening, AIRDI 150 high carbon-high chromium, AIRKOOL air-hardening, and NU DIE V hot-work tool steels — from a conveniently located Crucible branch warehouse.

Let your Crucible representative show you how these steels can best help *you*.

CRUCIBLE first name in special purpose steels

54 years of Fine steelmaking **HOLLOW TOOL STEEL**

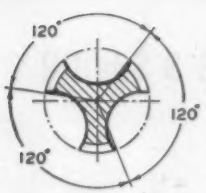
CRUCIBLE STEEL COMPANY OF AMERICA • TOOL STEEL SALES • SYRACUSE, N. Y.

BALANCED Action

CAN YOU AFFORD TO USE TAPS THAT DO NOT HAVE IT?

When you consider the many cost-elements that go into production, you'll agree: "It's penny-wise and pound-foolish to compromise with the *quality of the tool.*"

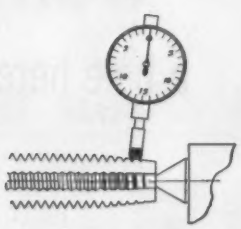
Specify taps with Balanced Action—an inbuilt feature of the Winter line, exclusively—for accuracy and long life.



Exact Flute Spacing

Uniform Flute Contours

Precision Chip Driver Contours



Accurate and Concentric Chamfers

ALWAYS AT YOUR SERVICE

Your local Industrial Supply Distributor carries a complete stock of WINTER Taps

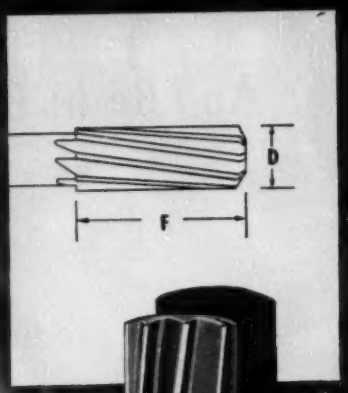
WINTER

WINTER BROTHERS COMPANY

Rochester, Michigan, U.S.A. Distributors in principal cities. Branches in New York, Detroit, Chicago, Dallas, San Francisco. Division of National Twist Drill & Tool Co.

NATIONAL TWIST DRILL & TOOL
ROCHESTER, MICH., U.S.A.

National



FOR SMOOTH, ACCURATE HOLES —AND LOTS OF THEM!

National Reamers are ground to very close limits, with National's fine cutting edges. Lands and flutes are carefully proportioned. Materials and heat treatment are the finest . . . Result: *smooth, accurate holes*—and many, many of them!

NATIONAL TWIST DRILL AND TOOL COMPANY

Rochester, Michigan, U.S.A. Distributors in principal cities. Factory Branches: New York • Detroit • Chicago • Dallas • San Francisco Los Angeles

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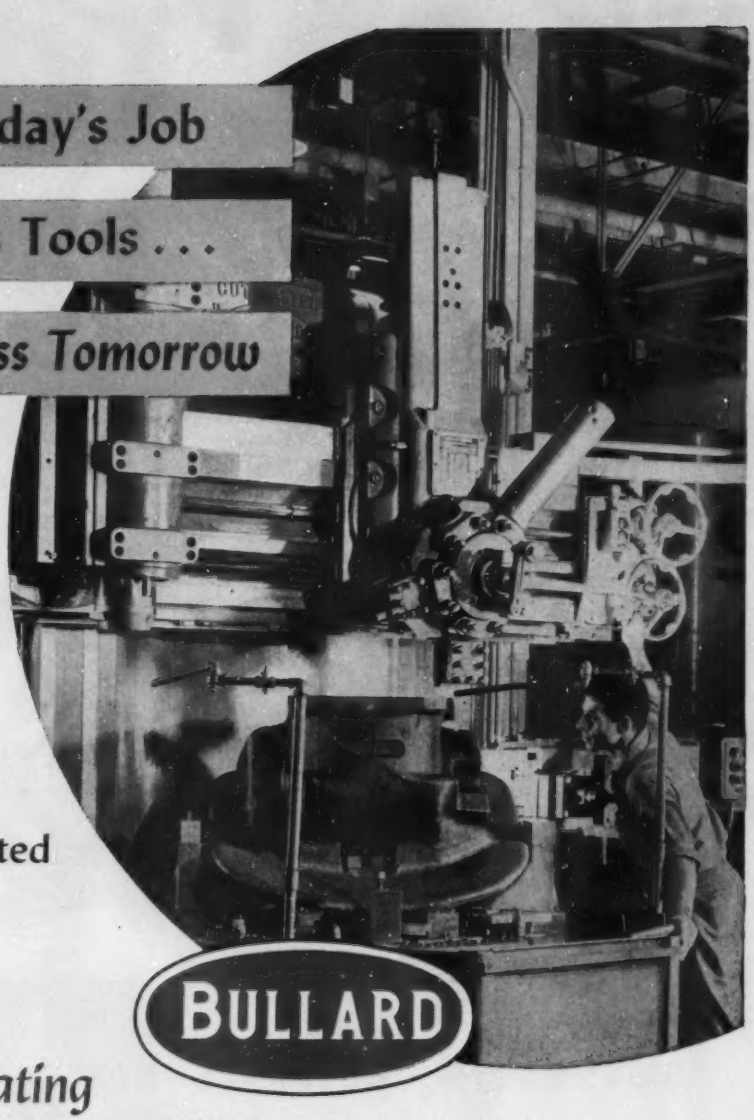
. . . for all your staple industrial needs, including NATIONAL Twist Drills, Reamers, Counterbores, Milling Cutters, End Mills, Hobs, and Special Tools

You Can't Do Today's Job With Yesterday's Tools . . . And Be In Business Tomorrow



new products,
new methods,
new materials
and new cutting
tools have out-dated
many machine
tools still in use

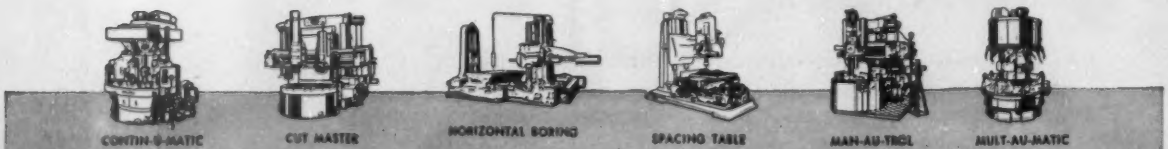
BULLARD

Is your plant operating under this handicap?

If so, it will pay you to investigate the Bullard Cut Master Vertical Turret Lathe.

It is available in six sizes, 30-36-42-54-64 and 74 inch, incorporating outstanding engineering developments which increase production, ease of handling and accuracy; and decrease maintenance — insuring greater profits through lower manufacturing costs.

For full details, call your nearest Bullard Representative or write to:



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Years of successful experience in special tooling and related production problems are yours for the asking. When the job requires special cutting tools call in your National Tool Co. representative. He is backed by more than 49 years experience in the engineering and manufacture of special cutting tools. His assistance is yours, without obligation, whether you're interested in one tool or a complete tooling program.

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INDUSTRIAL TOOLS FOR INDUSTRIAL USERS
The
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They're Precision Machine
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Consistent Excellent Performance—Unusual Economy and Ultra Precision work has firmly established Jarvis Solid Tungsten Carbide Tools among users who know quality.
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Jarvis
THE CHARLES L. JARVIS CO., MIDDLETOWN IN CONNECTICUT

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AN INDUSTRIAL MACHINE FOR INDUSTRIAL USERS

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Grinding, Cutting, Buffing or Rotary Filing

Whether your operations call for GRINDING, CUTTING, BUFFING, SANDING or ROTARY FILING, Jarvis Flexible Shaft Machines are available in BENCH, FLOOR or OVERHEAD Types — in Single or Multiple Speeds to suit your Individual Requirements.

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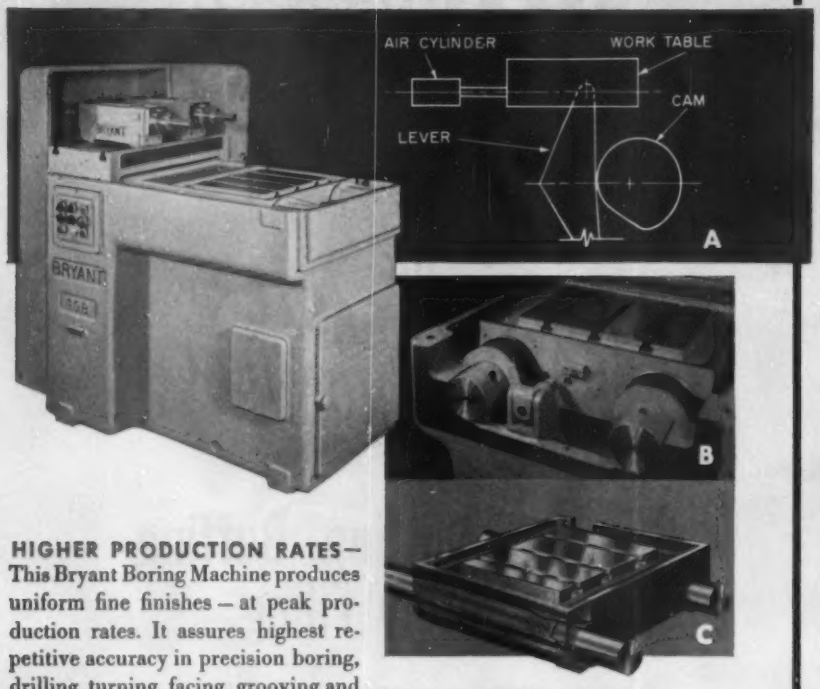
A new approach to

...PRECISION BORING



HIGHER PRODUCTION RATES—This Bryant Boring Machine produces uniform fine finishes—at peak production rates. It assures highest repetitive accuracy in precision boring, drilling, turning, facing, grooving and contour boring and turning.

The table is actuated by a simple cam and lever unit **A** which provides positive control of the cycle at all times. This mechanical actuation eliminates variation in the cycle due to temperature change.

FINER FINISHES—The Bryant 998 provides the smooth, uniform table motion so essential in generating a fine finish with a single point tool. The table moves on two 4" diameter solid steel slide bars **B** firmly bolted to the bed. The table is supported by two anti-friction preloaded ball bearings on each of these bars. This construction provides a metal-to-metal contact which eliminates shifting due to an oil film **C**.

MINIMUM DOWN-TIME—The Bryant 998 requires minimum servicing—motors, boring heads and slides are permanently grease sealed. Every unit is easily accessible.

SPECIFICATIONS—Total table stroke: 6"; Top of table to top of bridge: 4"; Width of bridge: 27⅜"; Multiple boring heads as required by tooling to a maximum of 4 (209) heads; Boring head motor: 5HP; Table dimensions: 17½" x 22"; Floor space (without coolant tank): 31" x 54".

Write today for complete details!

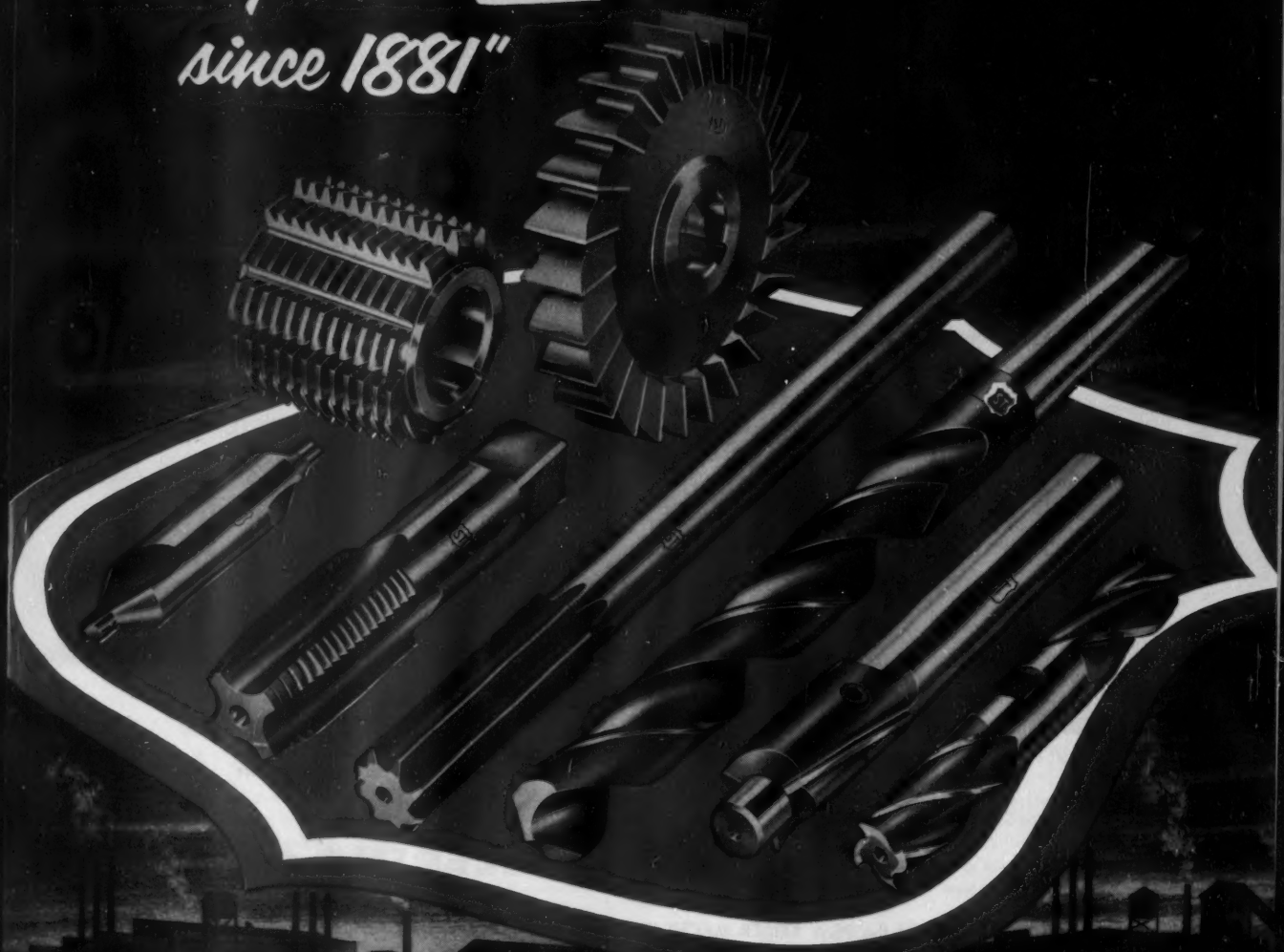
BRYANT Chucking Grinder Co.
SPRINGFIELD, VERMONT, U. S. A.

Internal Grinders • Boring Machines
Internal & External Thread Gages • Granite Surface Plates

20 REASONS WHY...

- Bed, bridge, table and heads are normalized Meehanite castings.
- Cam actuated table moves on preloaded ball slide bars.
- Cam is hardened and ground.
- Boring head spindles rotate in preloaded ball bearings.
- Air cylinder opposes the work table motion directly with constant pressure and keeps the cam follower roll and the cam always in contact.
- Boring head drive is completely accessible.
- Cam drive assembly is protected by a torque limiting clutch.
- Cycle time is controlled by precision change gears in the cam drive gear box.
- Pad is provided at the rear for mounting accessory equipment.
- Push button controls are conveniently located.
- Manual, semi-automatic or fully automatic cycle.
- Emergency stop button instantaneously interrupts the cycle.
- Jog buttons on both front and rear of the machine for setup purposes.
- Machined setup pads are provided on the bridge for ease in locating fixtures.
- Maintenance is necessary at only three points: two grease fittings on the cam follower assembly and cleaning and filling of the filter-lubricator unit in the pneumatic system.
- Ball slide table is grease sealed.
- Gear box has its own closed lubrication system.
- Boring head bearings are permanently grease sealed.
- Cam is easily accessible for changing the table stroke.
- Change gears are enclosed in their own wet sump, splash lubrication system.

"STANDARD for cutting metal and costs since 1881"



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Cut machining costs . . . standardize with Standard. Complete line . . . top quality tools. Backed by factory application specialists coast to coast. Distributors in all principal cities.

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We Built a Reputation...

PRATT & WHITNEY KELLER

Automatic Tracer Controlled Milling MACHINES

are now FASTER, MORE EFFICIENT than ever before

With a work area of 36" x 20", the Type BL Keller is ideal for a wide variety of smaller jobs. Both single and 3-spindle models are manufactured. Other Keller Machines accommodate practically any required work size up to 20 feet horizontally by 7 feet vertically.

"KELLERING" *means...*

Throughout industry, use of the P&W KELLER MACHINE to produce complex 2- and 3-dimensional forms by tracer-controlled milling has become so popular and so widespread that this type of machining is universally known as "Kellering."

Yes, we at Pratt & Whitney are proud of this recognition and reputation. But we also know that reputation and past performance ***alone*** aren't enough to insure ***your*** continued profitable operation in the face of increasingly competitive markets and constantly rising production costs.

For this reason, we have carried on a program of continuous research, development and improvement. As a result, P&W Keller Machines — always outstanding performers — now offer the increased speeds, feeds and inbuilt efficiency to meet today's demands for still greater productivity. In many applications, actual on-the-job performance has proved that Keller Machines are ***now more than twice as fast*** as older machines or older methods.

- **FAST, ECONOMICAL REPRODUCTION OF COMPLEX SHAPES** . . . that cannot be machined economically by any other means.

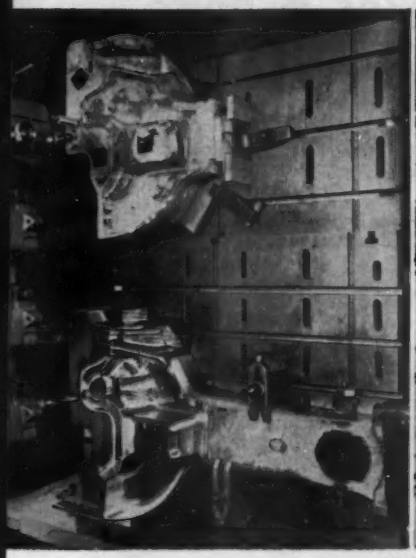
- **AN UNLIMITED VARIETY OF JOBS WITHOUT EXPENSIVE ATTACHMENTS** . . . because P&W Keller Machines are designed and built *specifically* for tracer-controlled milling, not just adapted.

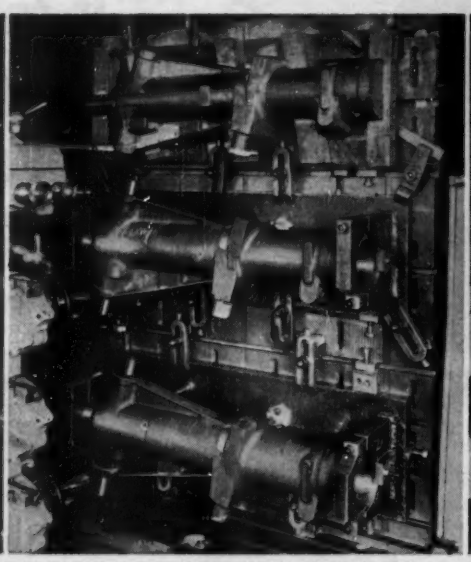
- **RUGGED DEPENDABILITY** . . . Kellers stay on the job year after year without frequent or expensive maintenance.

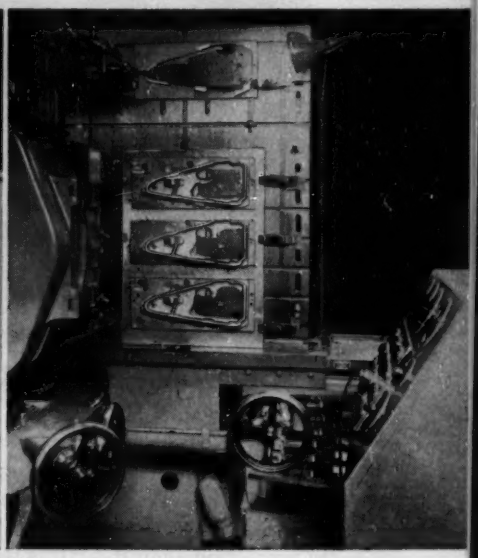
- **ELECTRIC TRACER CONTROL** . . . that is dependable, relatively simple, retains high initial accuracy without complicated adjustment. ***Profiling*** to a pre-set depth following an outline template . . . or ***3-dimensional milling*** following a full model.

but We're Not Resting on it!

ALL THESE JOBS . . . DONE QUICKER, BETTER







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DIES, MOLDS AND METAL PATTERNS

The complex 3-dimensional shape of a plaster model is duplicated in a large brass casting to produce a pattern for a railroad coupling. Using only one of its 3 spindles, the Keller Machine easily accommodates this large workpiece.

PROTOTYPE AND PILOT PRODUCTION

Producing parts for aircraft landing gear, this P&W Keller Machine mills two steel forgings simultaneously. The exact shape of the mahogany model shown at the top is accurately duplicated with speed and economy.

PRODUCTION MILLING AND PROFILING

Precision profiling 3 aluminum alloy castings at a time, this P&W Keller 3-Spindle Machine economically makes production runs on aircraft ribs. The model, in this case, is an inexpensive, 2-dimensional steel template.

Maintaining Your Reputation

. . . and your profits demands constant progress and improvement with a well conceived program of replacement and modernization. Plan to include ***new*** P&W Keller Machines in your program . . . benefit by the added productivity they can bring to today's *and* tomorrow's jobs. Write to the P&W Branch Office nearest you . . . or direct to West Hartford . . . for your free copy of Circular No. 490-3 that fully describes the Type BL Keller Machine.

MODERNIZE with PRATT & WHITNEY REPLACE FOR PROFIT

PRATT & WHITNEY

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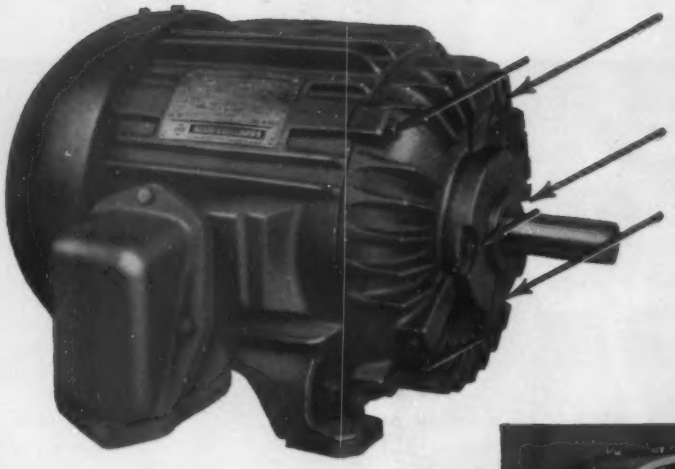
Here's motor superiority

you can see



It takes 6 bolts not just 4 to give full bearing protection

THE TWO EXTRA BOLTS in the end housing of every Allis-Chalmers ball bearing motor are the proof of *extra* protection against bearing failure. These are the bolts that hold the bearing cap tightly in place against the inner face of the bearing enclosure. This cap, with its close running clearances, keeps grease from the interior of the motor . . . retains an ample supply within the bearing enclosure . . . protects the grease and the bearing against contamination from dirt and moisture.

At the outer side of the bearing, double labyrinth seals keep grease in, also keep dirt out. What's more, large grease reservoirs act as additional dirt traps.

Result? Allis-Chalmers motors pay off in longer, trouble-free bearing life, lower motor maintenance.

Get all the facts . . . judge for yourself — Compare Allis-Chalmers motors with other motors. Get the six-bolt construction that gives you complete bearing protection. For proof, see your Allis-Chalmers Office or Authorized Distributor, or write — Allis-Chalmers, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

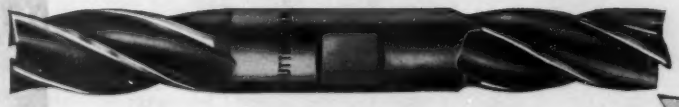
A-C ALLIS-CHALMERS

A-4441

Announcing

MILLING CUTTERS *and* END MILLS *by* Butterfield

With the addition of Milling Cutters and End Mills, Butterfield now offers a full line of metal cutting tools. Milling Cutters and End Mills are made to the same exacting standards of dependability and extra performance which mark Butterfield's Taps, Dies, Drills, Reamers, Counterbores, and Screw Plates.



BUTTERFIELD

UNION TWIST DRILL COMPANY
BUTTERFIELD DIVISION
DERBY LINE, VERMONT, U.S.A.

TAPS · DIES · DRILLS · REAMERS · COUNTERBORES · SCREW PLATES · MILLING CUTTERS · END MILLS

FOR BETTER SERVICE
CALL YOUR
BUTTERFIELD
DISTRIBUTOR

you can sharpen

4,800

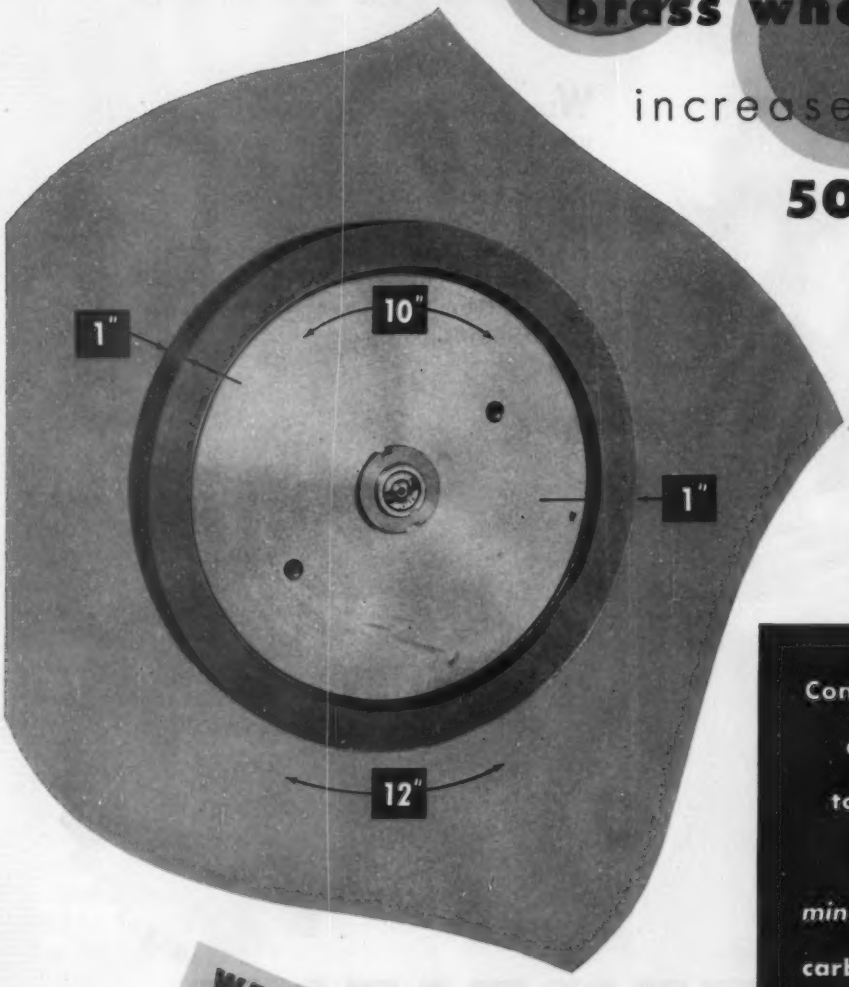
½ x ½ tungsten carbide

insert tools with this $45

brass wheel and

increase tool life

50 to 200%



Ave. cost per tool sharpened:

.009¢

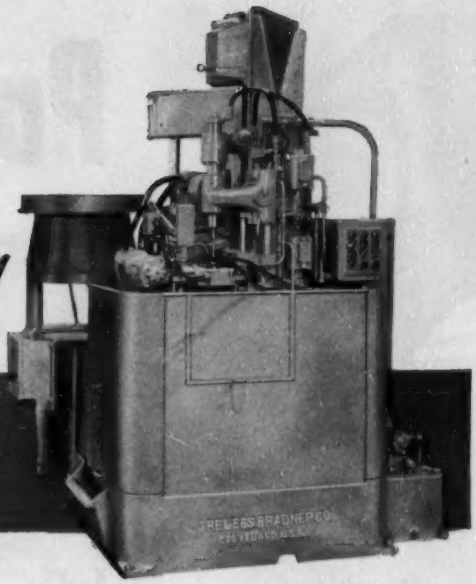
Convert from abrasive and diamond wheels to an Elox brass wheel and save *50 minutes* sharpening 20 carbide insert tools.

WE CAN SHOW YOU HOW!

elox *corporation of michigan*

728 north rochester road • clawson, michigan

Automation is here ...from blank to gear!



MODEL 7-A "AUTOMATIC" SINGLE-SPINDLE HOBBER

3" diameter, single-start hob
Runs at 350 R.P.M.
Feeds at .050" per revolution
Hobs two pieces per load
Hobs one gear every 45 seconds
16 teeth in gear
Face width of gear: ⅛"
Loading and unloading time: 2 seconds

The famous Lees-Bradner 7-A single spindle hobber has now gone completely automatic!

From blank to finished gear the whole operation is "push-button". Here's how it works:

Blanks are fed from a Syntron Vibratory Feeder down a rack to an automatic pick-up arm or loader.

The loader picks up two blanks at a time and moves them to the hobbing position under an expanding mandrel. The mandrel holds the blanks while the hob moves forward automatically to commence the hobbing operation.

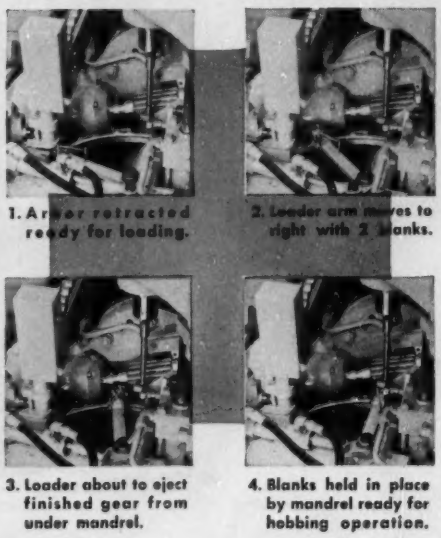
After the gears have been hobbed they are ejected by the loader as it sets the next two blanks in hobbing position.

As a control measure, the machine will not operate if:

- **The blanks are not in the loader**
- **The blanks are not removed from the arbor**
- **There is not sufficient hydraulic clamping pressure**

In the operation pictured the machine is hobbing a pinion gear for an automatic transmission.

Write to the company for details on this amazing new automatic hobber.

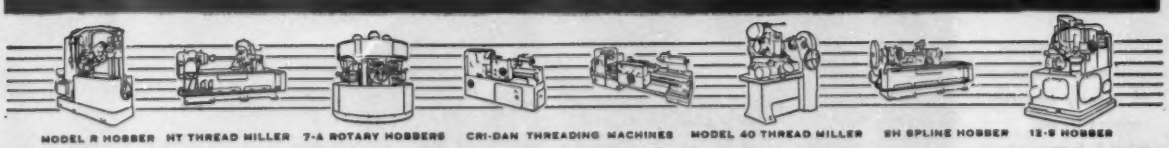


1. Arbor retracted ready for loading.
2. Loader arm moves to right with 2 blanks.
3. Loader about to eject finished gear from under mandrel.
4. Blanks held in place by mandrel ready for hobbing operation.

The Lees-Bradner 7-A Automatic Hobber is available in single units or quadruple mountings. (4 machines in line with common base, coolant tank, master control and feeder.)

the LEES-BRADNER Company

CLEVELAND 11, OHIO, U.S.A.



MODEL R HOBBER · HT THREAD MILLER · 7-A ROTARY HOBBERS · CRI-DAN THREADING MACHINES · MODEL 40 THREAD MILLER · 8H SPLINE HOBBER · 12-S HOBBER

IF YOU THREAD OR HOB . . . GET A BETTER JOB WITH A LEES-BRADNER

Progress is built

Fairbanks-Morse will also continue to supply electric motors in *old* NEMA frame sizes.

. . . brick by brick

The new NEMA Standard for electric motors is a significant sign of progress to all industry—More Power in Less Space.

But progress—to be lasting—must be built brick by brick

For more than a century, Fairbanks-Morse designers have held to the ideal of more performance in less space. They have produced outstanding advancements in the design of diesel engines, pumps, scales, locomotives and the many other products that feature F-M exclusives. Fairbanks-Morse electric motors built on this basic F-M engineering philosophy are continuing assurance of operating economy and efficiency.

Look for the electric motor that stands on this Fairbanks-Morse solid foundation of design progress. It carries the Fairbanks-Morse Seal of Quality.

NEW FAIRBANKS-MORSE GUARDED DRIPPROOF MOTORS

1 Guarded, drippreof construction keeps falling objects and dripping liquids out of motor in any mounting position —maximum motor protection under conditions of wet or dirty operation —indoors or out.

2 Exclusive Fairbanks-Morse feature that provides a virtually indestructible one-piece rotor —homogeneous, free from flaws and gas inclusion for maximum strength and lifetime service.

3 Oversized, precision ball bearings in spacious housings, sealed against grease leakage. Contain ample lubrication for extended periods of rugged service. Convenient flushing and re-lubricating available if desired.

4 F-M exclusive design eliminates hot spots. Cooling outside air is drawn into motor through openings in lower portion of both bearing arms and circulated through cored passages in the frame.

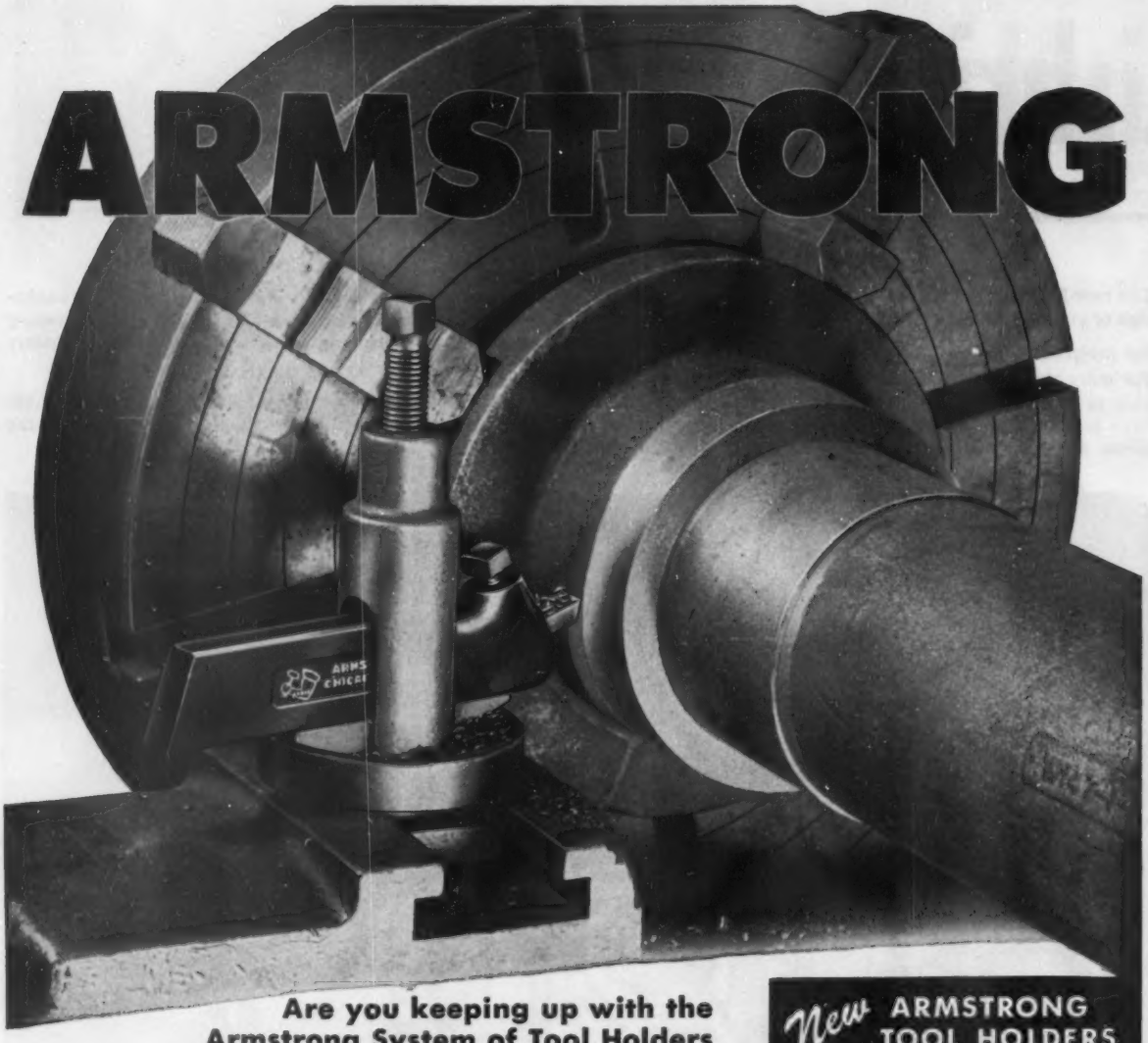
5 New, gasketed, cast iron conduit box permits easy pulling of cables without insulation damage. Fairbanks-Morse exclusive: recess feature allows elimination of conduit box where space is limited.

FAIRBANKS-MORSE

a name worth remembering when you want the best

ELECTRIC MOTORS AND GENERATORS • DIESEL LOCOMOTIVES AND ENGINES • PUMPS • SCALES • RAIL CARS • HOME WATER SERVICE EQUIPMENT • FARM MACHINERY • MAGNETOS

ARMSTRONG



Are you keeping up with the Armstrong System of Tool Holders

Doubtless you are daily using ARMSTRONG TOOL HOLDERS that have been in continuous operation for many years. This is sound practice, for this means added profits without added tool costs. But to become complacent, so satisfied that you forget your ARMSTRONG TOOL HOLDERS, is unwise. The "Armstrong System" is a growing thing, with new types and sizes of ARMSTRONG TOOL HOLDERS constantly being developed to more effectively meet new machining conditions, or to take advantage of newly developed cutting materials.

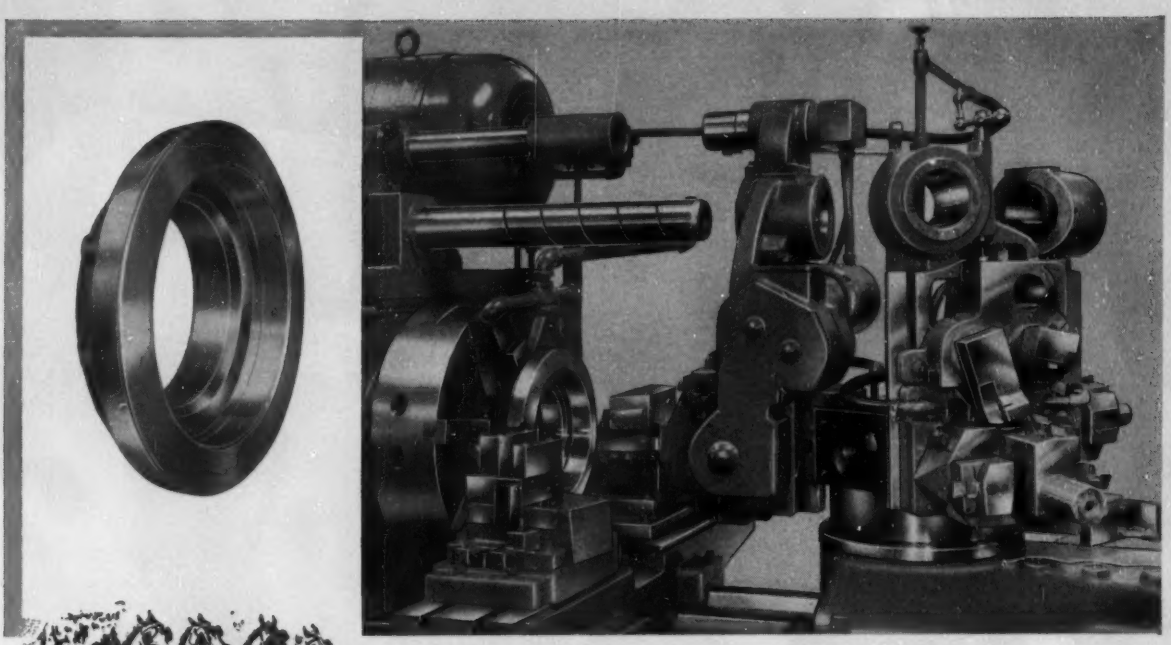
With modern ARMSTRONG TOOL HOLDERS for each operation, you can greatly increase speeds and feeds. You can lower machining cost and further increase profits.

If you haven't kept up with the "Armstrong System" write for an ARMSTRONG Catalog and check to see that you are using the most efficient ARMSTRONG TOOL HOLDER for each operation on all lathes, planers, slotters and shapers.

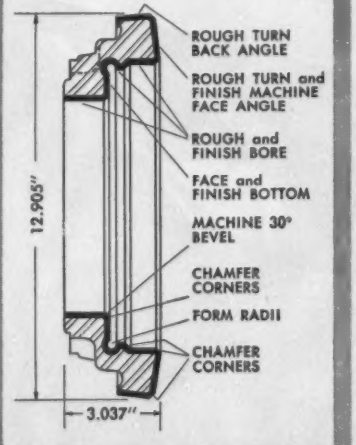
WRITE FOR CATALOG

New ARMSTRONG TOOL HOLDERS
ARMSTRONG Spring Form Threading Tool Holder
ARMSTRONG Spring Cutting-off Tools
ARMSTRONG Carbide Tool Holders for Carbide-Tipped Cutters
ARMSTRONG "C-A" Tool Holders for ARMALOY (Cast-Alloy) Cutter-Bits

ARMSTRONG BROS. TOOL CO. *"The Tool Holder People"* 5215 W. ARMSTRONG AVENUE CHICAGO 30, ILL.



FORTY HORSES "pulled the team" that made this bevel gear blank



The Powerful 6DREL-40 Automatic Turret Lathe -- and P&J Tooling

Machining a forged-steel truck bevel gear blank — 14 distinct cuts with tungsten carbide tools in just 5.88 minutes (including chucking time) — takes a team with plenty of horses to pull it . . . A TEAM LIKE THE **P & J 6DREL-40 AUTOMATIC** (NOW WITH 40 HORSEPOWER), PLUS JOB-ENGINEERED **P & J TOOLING.** Here's the team to choose for doing your tough jobs faster . . . and at a lower per-unit cost!

If you're looking for real productive power, it will pay you to look at the 6DRE-40 and 6DREL-40 Automatic Turret Lathes. Write for informative booklet describing these Automatics. Ask for Bulletin No. 128 . . . or ask the P & J Tooling Engineer to submit recommendations based on your sample parts or prints.

MODERNIZE with POTTER & JOHNSTON REPLACE FOR PROFIT

POTTER & JOHNSTON Co.
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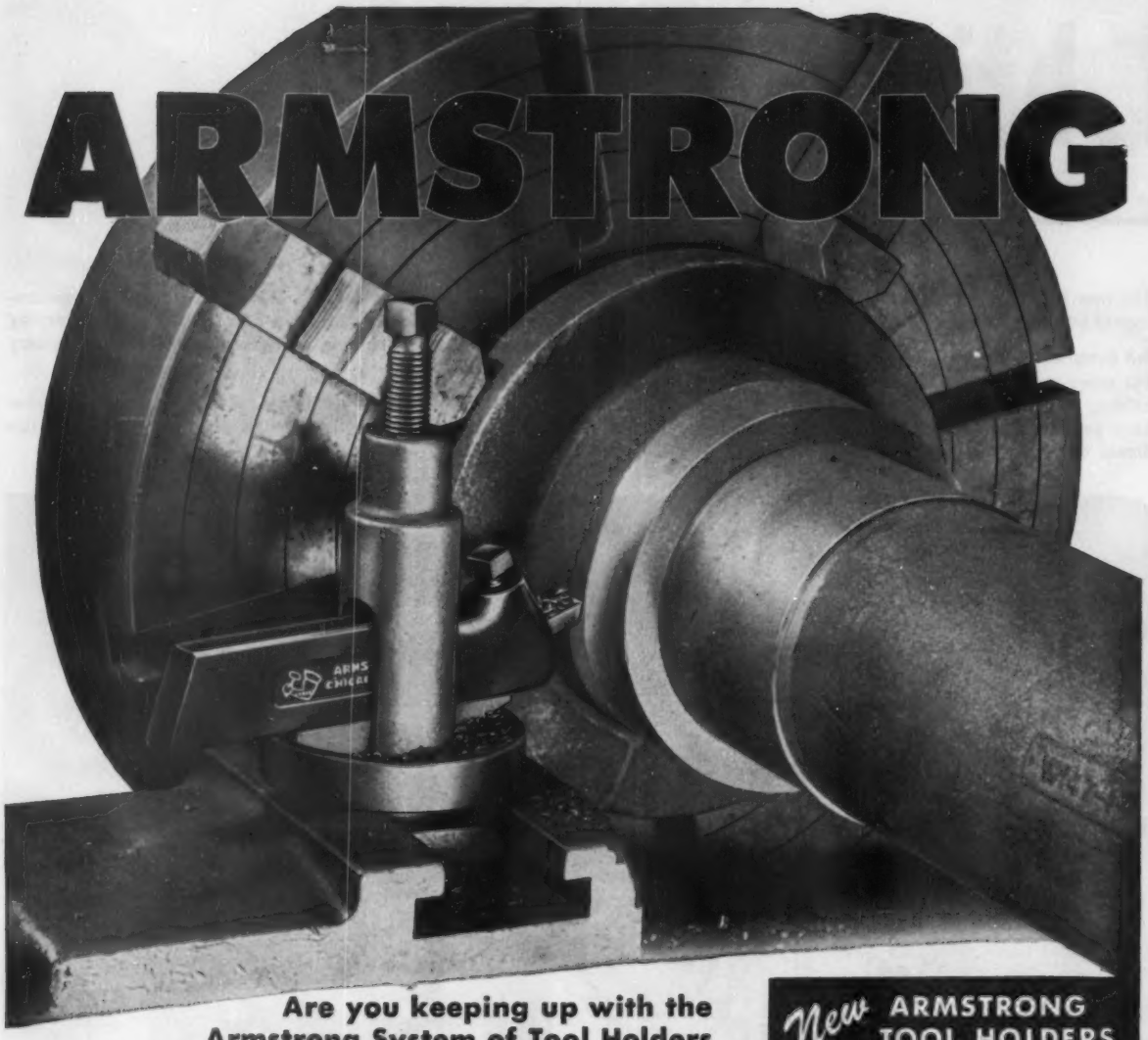
PRECISION PRODUCTION TOOLING FOR MORE THAN FIFTY YEARS

ARMSTRONG



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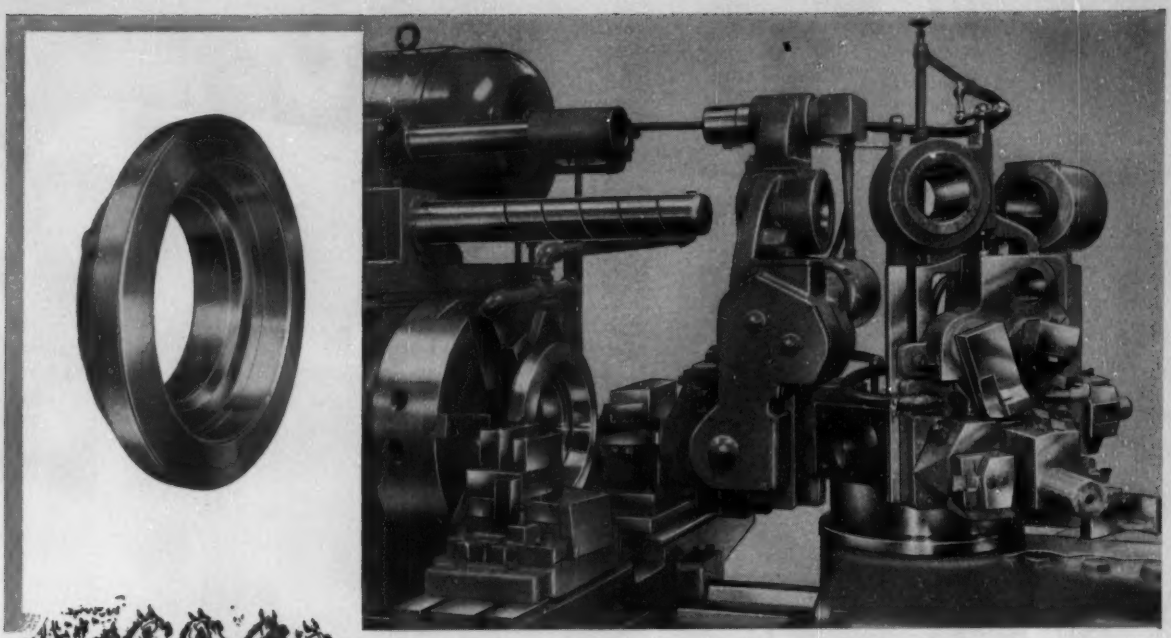

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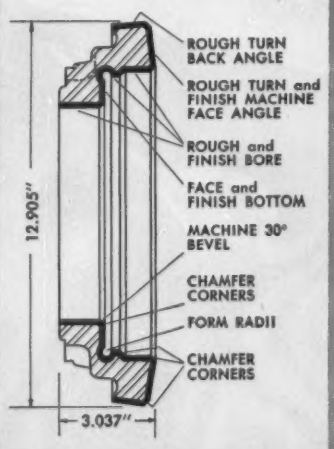

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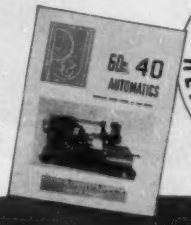

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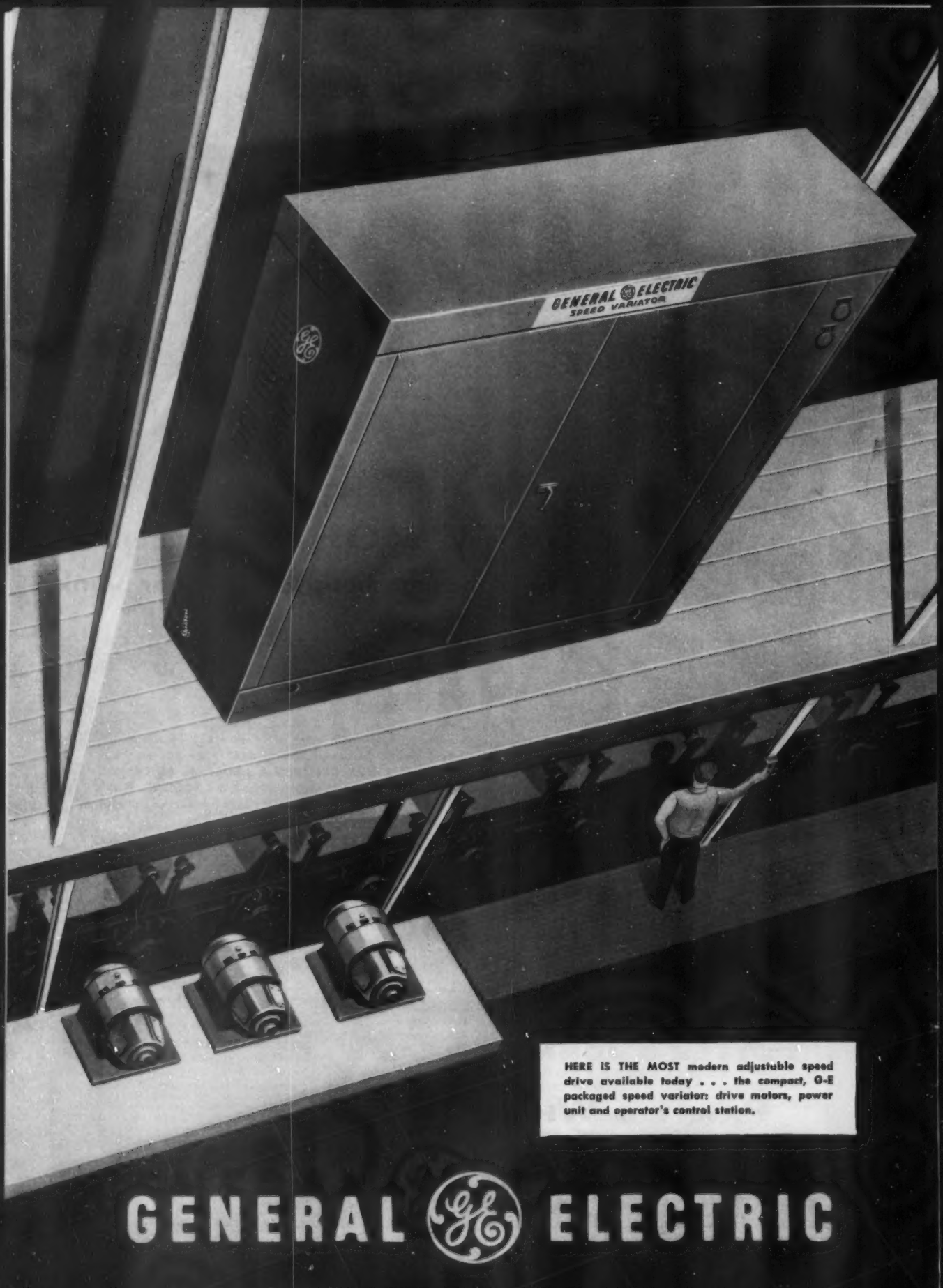
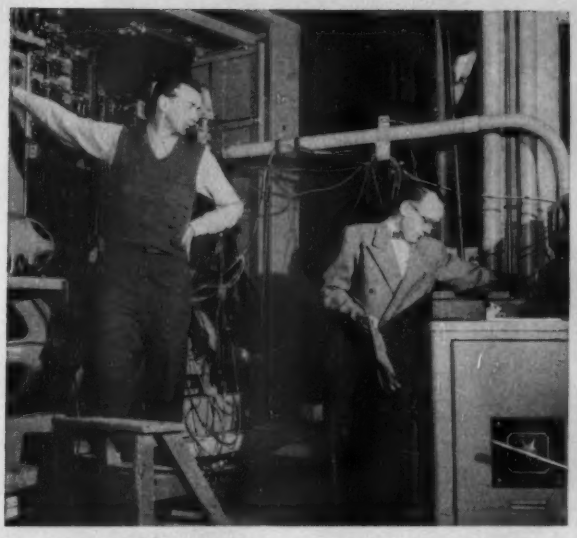
PRECISION PRODUCTION TOOLING FOR MORE THAN FIFTY YEARS



HERE IS THE MOST modern adjustable speed drive available today . . . the compact, G-E packaged speed variator: drive motors, power unit and operator's control station.

GENERAL ELECTRIC



COMPLETELY PRETESTED by G-E engineers in the factory, the packaged speed variator comes to you tailored to your job. Picture shows a power unit on one of the factory tests.

PACKAGED DESIGN of G-E speed variator simplifies installation, saves space and lessens your maintenance problems. Picture shows ready accessibility of all parts.

4 Good Reasons for Buying G-E PACKAGED Speed Variators

There's a *difference* among adjustable-speed drives; here's why the General Electric *packaged* speed variator is your best buy:

1—JOB-TAILORED. When your new G-E drive is delivered, it has already been tailored to your specifications. It's coordinated, packaged, assembled and *completely tested* before it leaves the G-E factory. It's been *engineered* as a package to help meet your needs.

2—MORE COMPACT. Because there are only three components to the G-E *packaged* speed variator (see opposite page), less space is needed for the complete installation. This cuts down on costly, interwiring problems, and leaves valuable floor space available. The G-E packaged speed variator is designed to be located near your equipment . . . up above, in a basement, right next to drive motor . . . anywhere you wish. No need for expensive control housing and associated ventilating system.

3—FASTER INSTALLATION. Your installation costs drop radically and your new G-E drive is in operation faster because it's packaged in the G-E factory before it's shipped to you. Long, unproductive work-stoppages are no longer necessary.

4—LESS MAINTENANCE. Your speed variator is made up of the standard, General Electric controls and rotating equipment that have proven their reliability and long life in many thousands of applications throughout industry. Because of these top-quality G-E components, maintenance is only a routine problem. And even *routine* maintenance is simplified because of the ready-access doors on the equipment. This packaged simplicity pays off in less downtime and actual dollar-savings in maintenance each year.

For further information, see your nearby G-E Apparatus Sales Office, or send in coupon. General Electric Company, Schenectady 5, N. Y.

Progress is our most important product

GENERAL ELECTRIC

Send coupon for your copy of new, 20-page bulletin (GEA-6127) on G-E packaged speed variators.

Section Q 822-1
General Electric Co.
Schenectady 5, N. Y.

Please send my copy of GEA-6127.

☐ For reference purposes only.
☐ For immediate application.

Name.....

Address.....

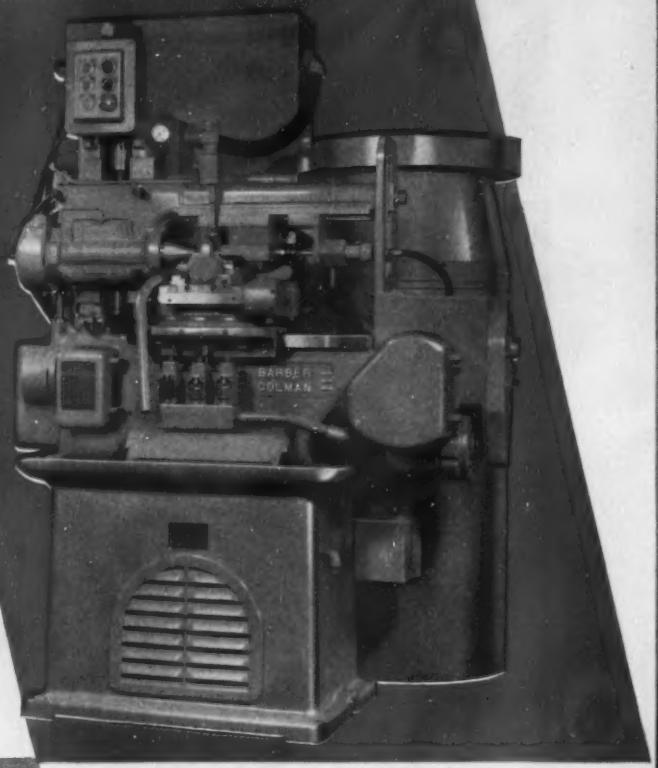
.....

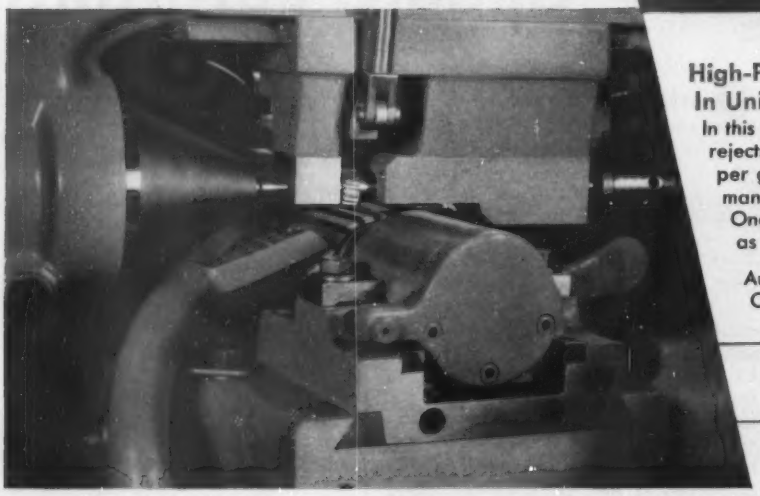
City..... State.....

Fully Automatic GEAR HOBBING

offers
new low costs
on gears
16 pitch or finer

As more and more gear operations are modernized to place them on a competitive basis, automatic gear hobbing equipment becomes an essential approach in reducing gear costs. Since 1937 Barber-Colman engineers have been working closely with major gear producers in the application of automatic gear hobbing. At first, automatic hobbing applications were made in the watch gear and instrument fields. Later, machines were built for medium pitches in other fields, such as fishing reel gears. Now this latest Automatic No. 6-10 Hobbing Machine is designed specially for cutting automatic transmission and speedometer gears to meet the required rate of production on an automatic production line.





High-Production Plant Reports Savings In Unit-Costs with Fewer Gear Rejects

In this particular production plant, fewer gear rejects are occurring. An overall reduction in cost per gear has been effected through reduced man-hours and continuous high-speed output. One of a battery of machines performs as follows:

Automatic Cycle —	356 Hob RPM, 175 Hob SFM; .050" feed per rev., 60-second complete cycle time.
Transmission Gear —	16 teeth, 18° 30′ helix angle 18 DP., SAE 1330, .937" OD. x ⅝".
Class C Accurate Unground Hob	1⅞" dia. x 3" face x ¾" bore, 3 threads, unground, pre-shave.

Completely Automatic Cycle Provides Continuous High-Speed Gear Cutting

Blanks are automatically loaded through a hopper-feed system and positively located and clamped hydraulically on a solid arbor in cutting position. The cycle sequence includes rapid traverse to the hobbing position, lowering of the work slide to cutting depth, hobbing the blank, raising the work slide, rapid traverse to the right, and unload. A new blank then is automatically presented for hobbing and the cycle repeated continuously until the machine is shut off.

Machine features include automatic hob shifting for greater tool life and metered hydraulic pressure for positive arbor mounting and ejection. Rapid traverse is actuated electrically, and the work slide is hydraulically actuated.

BUILDERS OF PRECISION GEAR

Adaptable to Wide Range of Long-Run, High Speed Gear Production.

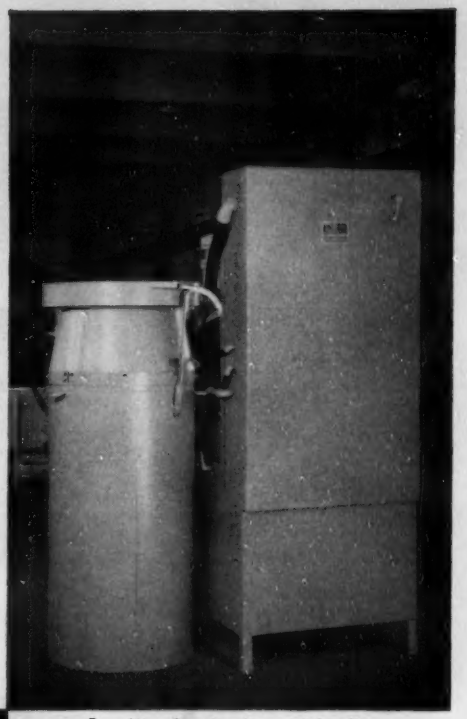
This type of cycle arrangement is adaptable to many similar long-run gear cutting operations within the general range of 16 pitch and finer, depending upon the particular gear specifications. The cycle is arranged to suit the requirements of the job, and tooling, feed, speed and cycle-timing will depend upon the required production and gear specifications.

Positive Control Over Gear Accuracy Through Automatic Arbor Loading.

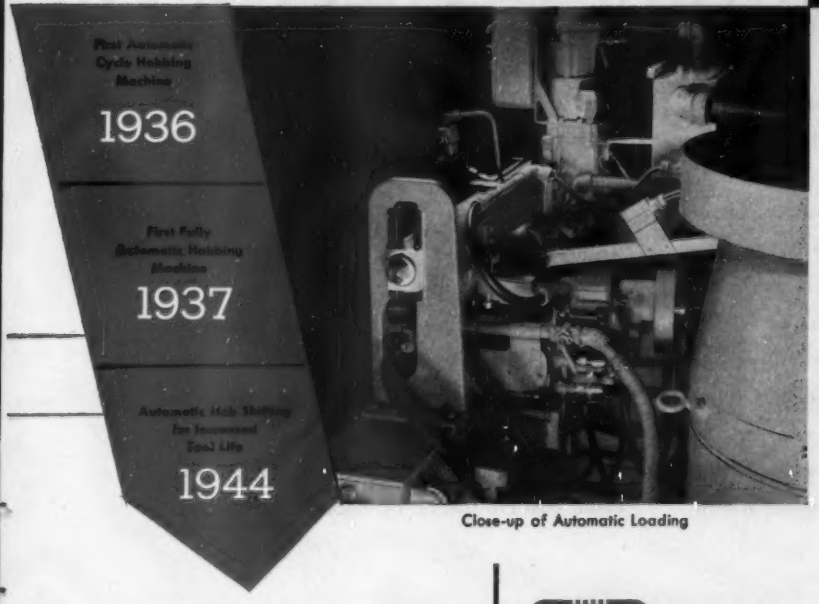
Barber-Colman automatic hobbing supplies positive gear accuracy control through specially developed tooling which mechanically mounts blanks solidly upon the work arbor prior to cutting. This arrangement eliminates chances for looseness, runout or vibration likely to occur in other types of mounting. Work arbors are designed for positive pick-up and location of the blank.

Cycle Fully Protected by Automatic Stops.

A combination of electric limit switches, program motor and mechanical movements governs the cycle. Faulty blanks are automatically rejected if presented for hobbing, and the machine is under complete control at all times.



Rear View Showing Automatic Loader and Electrical Panel



Close-up of Automatic Loading

Engineering Service Available Without Obligation

Check your high production gear operations to determine whether you are maintaining a competitive cost basis. Barber-Colman engineers will gladly consult with your gear production people to demonstrate the cost-saving benefits of automatic hobbing. Ask your Barber-Colman representative to arrange an appointment for you, or write directly to Automatic Hobbing Engineering. No obligation!

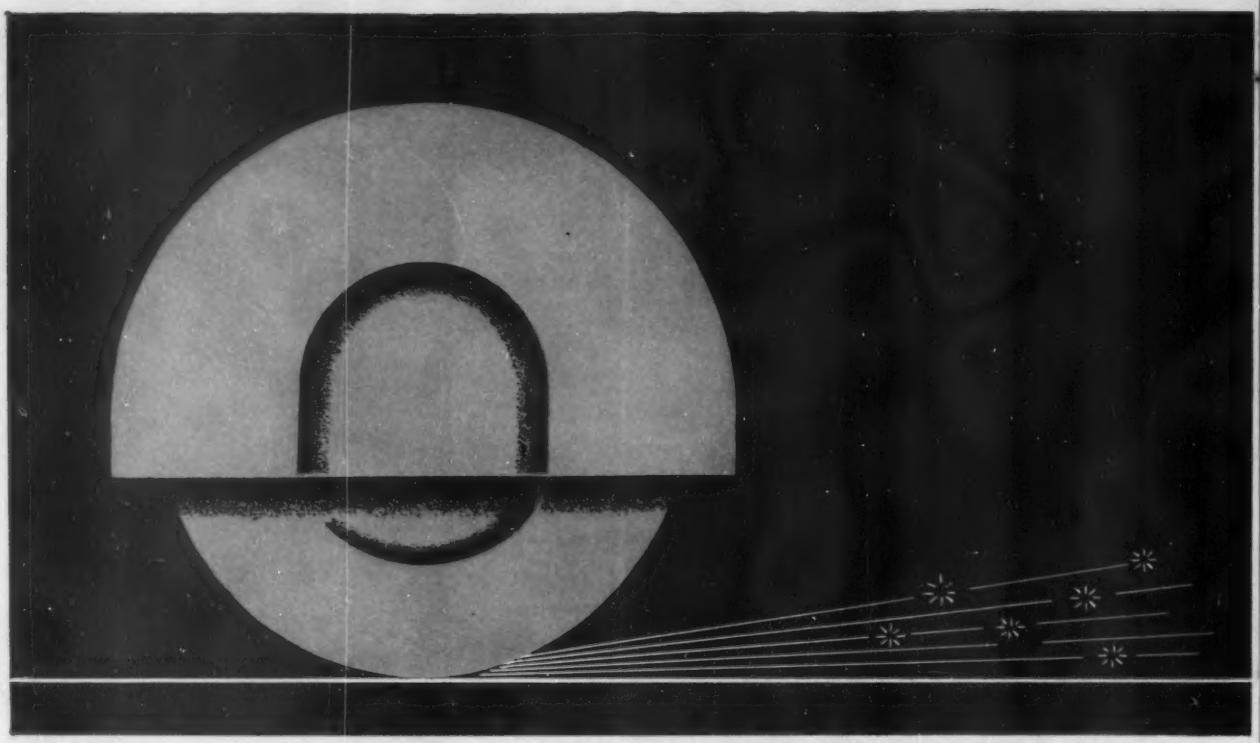
HOBS • CUTTERS • REAMERS
HOBBING MACHINES
HOB SHARPENING MACHINES

BARBER COLMAN

Barber-Colman Company

GENERAL OFFICES AND PLANT, 619 ROCK STREET, ROCKFORD, ILLINOIS

HOBS AND MACHINES SINCE 1911



Need Speed?... Accuracy?... Finish?...

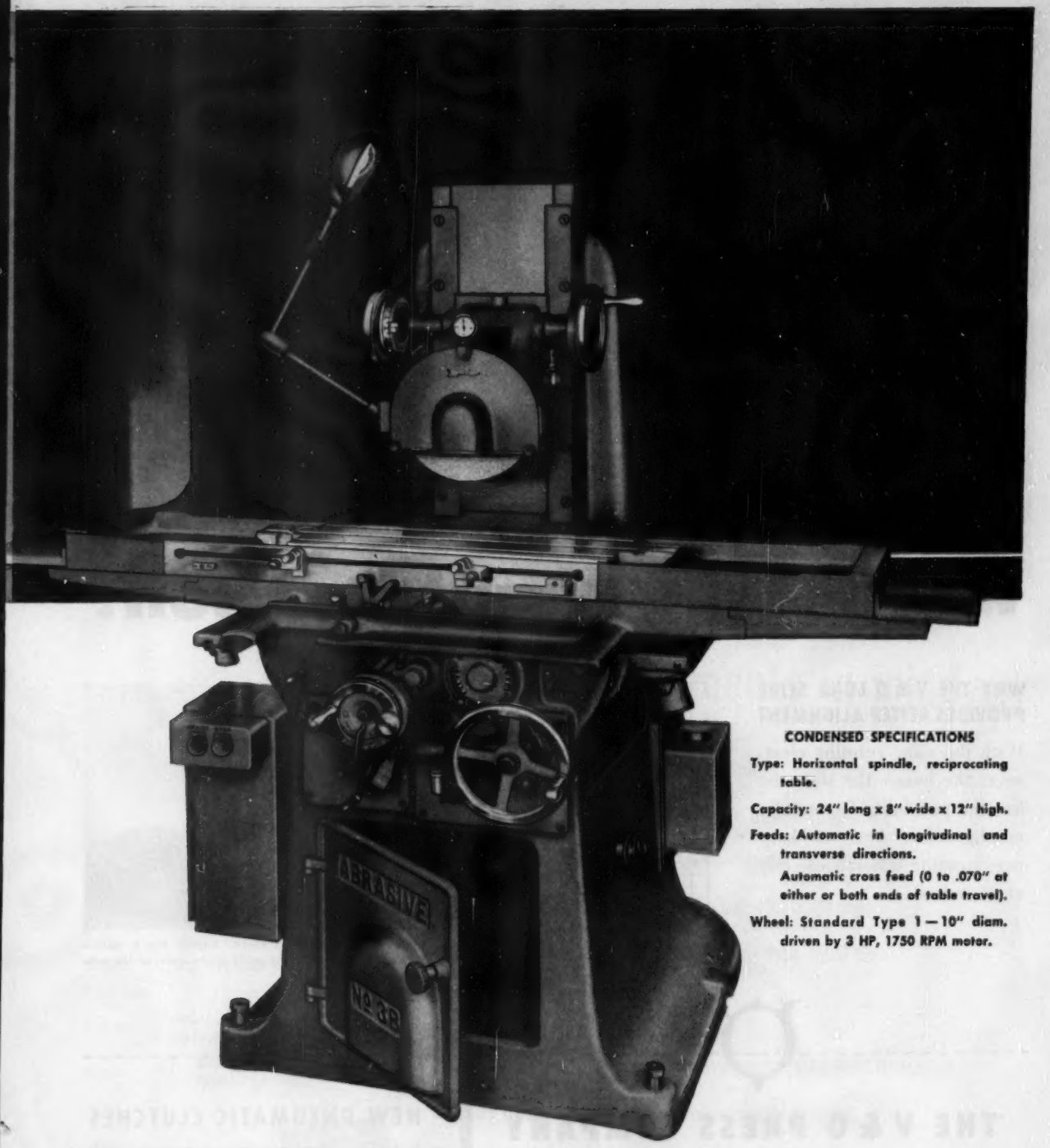
Get them all with the ABRASIVE No. 3B POWER FEED SURFACE GRINDER — one of the most productive and precise tools on the market today.

Feature for feature, the Abrasive No. 3B is unexcelled. It's massively built for maximum stability. Both toolmakers and production men know they can trust the No. 3B to hold size and finish within narrow limits. Automatic power feeds are easy to adjust and are located for greatest possible convenience. The large, open work table is designed for quick set-up and fast production. The No. 3B's unitized construction (bed, table, wheelhead, saddle, cross-feed mechanism, and gear case) provides easy accessibility. Quick adjustments or repairs can be made without calling in a specialist.

Thousands of Abrasive No. 3B Surface Grinders are in use in automotive, airplane engine, and tool plants throughout this country and abroad. If you are looking for the best in power feed surface grinders, it will pay you to find out about the Abrasive No. 3B. Write for descriptive catalog. Abrasive Machine Tool Company, 8 Dunellen Road, East Providence 14, Rhode Island.

ABRASIVE
ACCURACY BOOSTS PRODUCTION

ABRASIVE QUALITY IS RE



CONDENSED SPECIFICATIONS

Type: Horizontal spindle, reciprocating table.

Capacity: 24" long x 8" wide x 12" high.

Feeds: Automatic in longitudinal and transverse directions.

Automatic cross feed (0 to .070" at either or both ends of table travel).

Wheel: Standard Type 1 — 10" diam. driven by 3 HP, 1750 RPM motor.

FLECTED IN THE FINISH OF YOUR PRODUCT

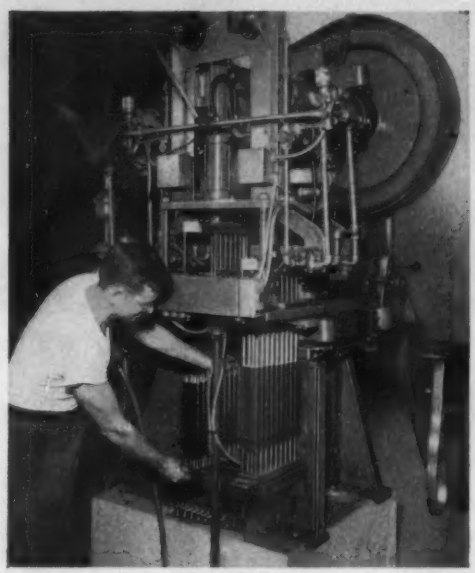
■ Automation needs exceptionally accurate, sturdy, trustworthy production machines. The high cost tooling and complex accessories do not permit anything less.

V & O has known all this for 65 years. The first V & O presses were designed because no others were adequate for automated tooling. The long slides, hand scraped ways, sturdyized features of V & O presses all were created for automation; all have been time-tested on highly automated operations. Our new controls and devices are designed solely for automation.

At V & O, automation is not a "new trend" with which to catch up. V & O never has had any other trend. That is why V & O presses can so easily put you ahead of the automation parade.

Write for the full story.

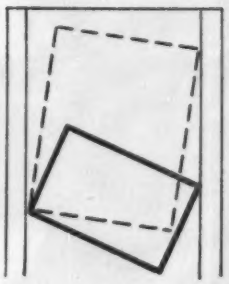
At the York Corporation plant this V & O corrugates, punches and flares copper fins; forms spacers; and stacks fins on copper tubes; all on a single machine.

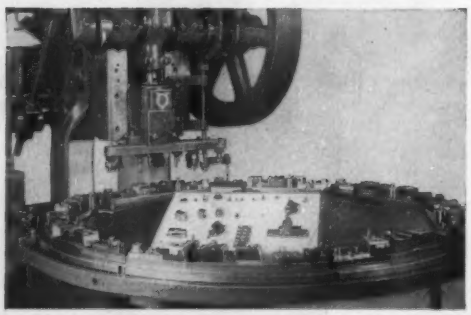


why FOLLOW automation?

WHY THE V & O LONG SLIDE PROVIDES BETTER ALIGNMENT

With the same running clearance, the longer the slide the less the possibility for angular misalignment. And we keep our running clearances very close indeed.





Long before the "automation craze" began, this 8 station dial feed V & O assembled the parts shown here, at the rate of 12 assemblies per minute.

THE V & O PRESS COMPANY

DIVISION OF EMHART MFG. CO.

HUDSON, NEW YORK

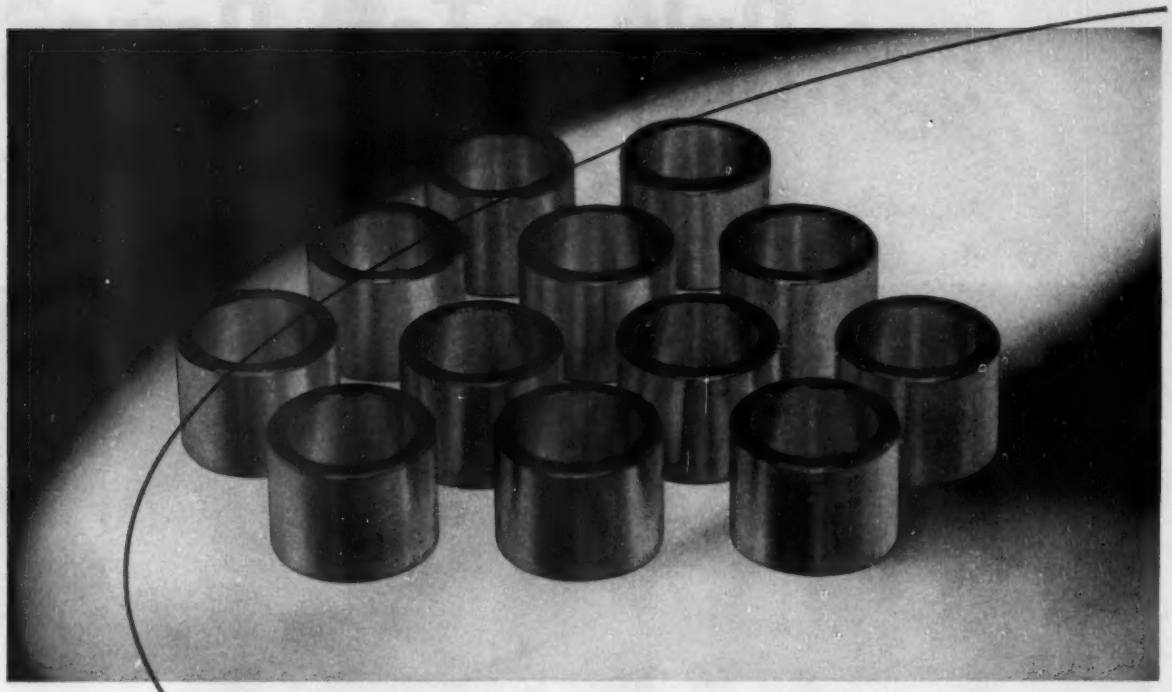
65th Anniversary

BUILDERS OF PRECISION POWER PRESSES AND FEEDS SINCE 1889

NEW PNEUMATIC CLUTCHES

V & O is now equipping presses with time-tested pneumatic clutches modified to provide improved economy, compactness and simplicity in press operation. They are unusually long-lived, self-ventilated, and designed to operate indefinitely with minimum maintenance. They increase the advantages of automation — and of better tooling.

No. 9 in a Series



these requirements in mind...

So varied are the demands on multiple spindle automatics it is impossible to design into one model — or a number of models — all the facilities that will satisfy every requirement. To excel in any range of work the design of a machine of this type must be directed toward that work.

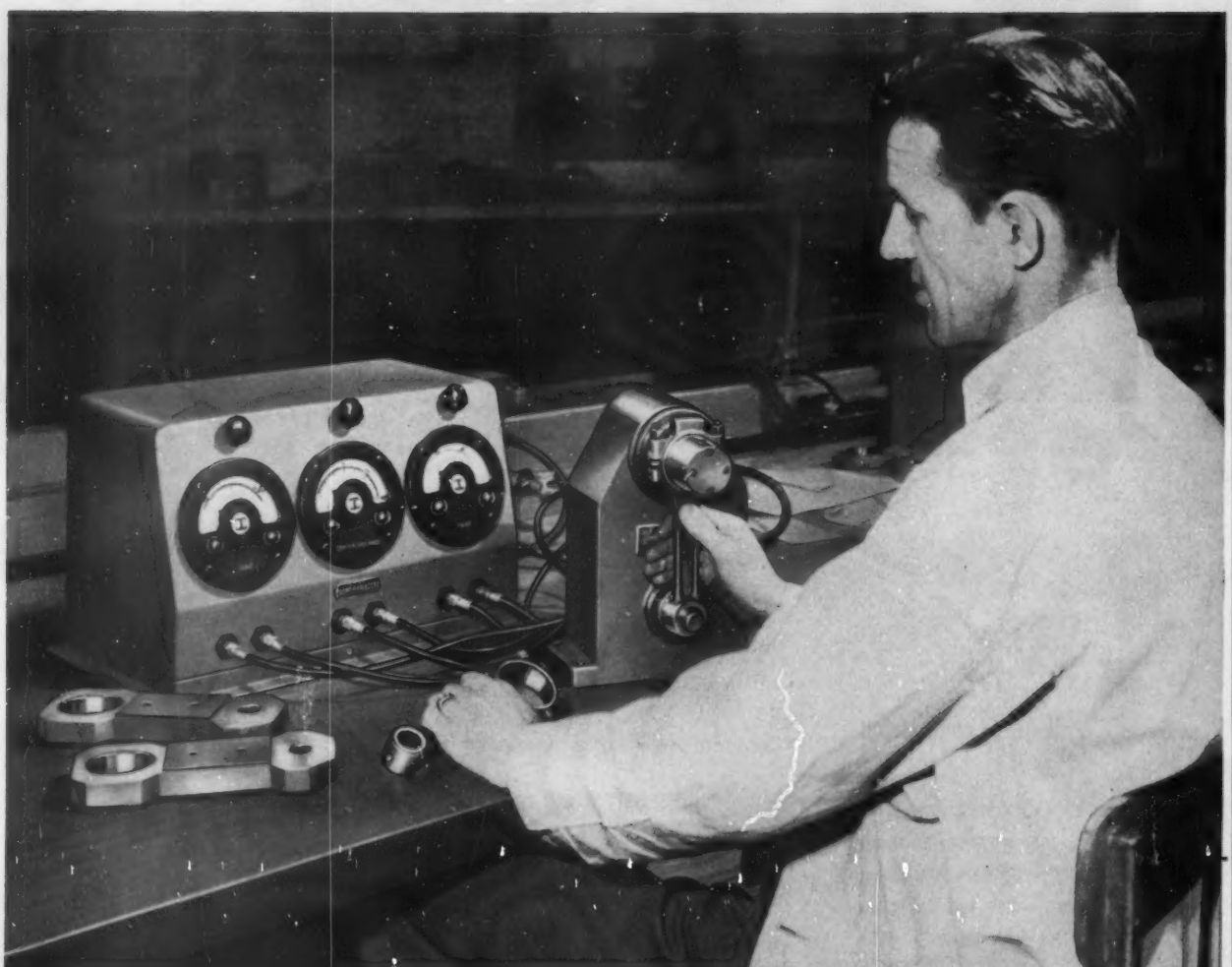
Cone's new General Datalog lists over forty CONOMATIC models that are designed with these requirements in mind. For any range of work, Conomatics are built to more efficiently serve the latest cutting tool materials.

data for comparison

Part	Bushing
Machine	1⅛" Six Conomatic
Tools	100% Carbide Tipped
Material	Stainless Steel Tubing
Stock Size	1¼" OD; ¾" ID
R. P. M.	Work Spindle — 1033 Opposed Spindle—1048
Time	7 Seconds per Cycle 3.5 Seconds per Piece

Conomatic CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.

Only a Taft-Peirce *Offers these 4*



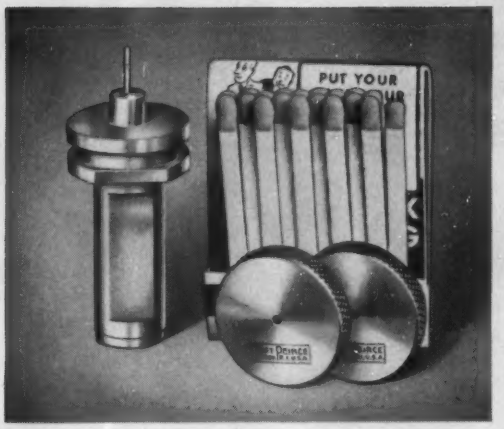
1 Computes Difficult Measurements Automatically

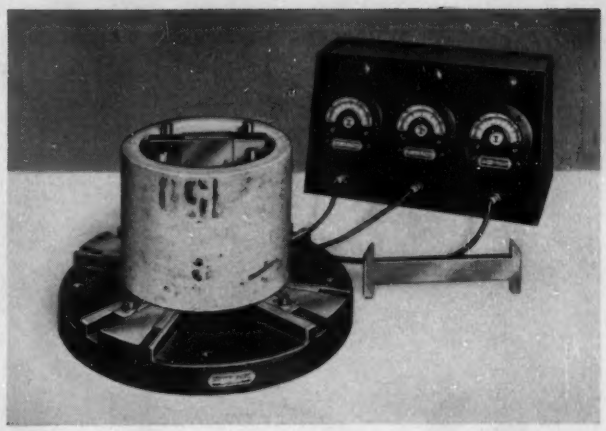
A T-P Computing CompAIRator eliminates the need for two measurements and a calculation. One gage, one dial, measures, calculates and indicates the final answer instantly on the dial face, for such difficult measurements as center distance without respect to hole size, deviation from angle or taper, concentricity, and squareness of bore to face.

The three dial Computing CompAIRator pictured above does the work of six dials in checking bend, twist, and center distance of connecting rods.

THE TAFT-PEIRCE MANUFACTURING

CompAIRator Air Gage
Great Features





2 Checks Diameters as small as .055"

The velocity-type circuit of a T-P CompAIRator, which permits use of tiny air passages and nozzles, makes these small measurements possible quickly and accurately.

3 Checks Tolerances up to 120 thousandths

T-P CompAIRator air-contact members can be furnished to permit measurements within this wider tolerance range with a standard unit.

4 Gives Simultaneous Signal Light and Dial Indications

A T-P Air-Electric CompAIRator offers the ultimate in speed for multi-dimensional gaging. It provides both exact size on standard dials *and* light indications for oversize, undersize, and within tolerance conditions.

Couple these great features with the greater speed, accuracy, and dependability of a T-P CompAIRator — and you know why thousands use and prefer them. Write for demonstration at your plant. Prove the time and money saving differences for yourself.

T-P means Top Precision

COMPANY, WOONSOCKET, RHODE ISLAND

reduce that part cost . . .

BROACH IT the *American* way

Broaching is a metal-cutting process that will remove stock to precision limits faster than any other metal-cutting process known — and will maintain those precision limits throughout production runs.

Below are a few jobs that have been done with American broaching tools and machines.

Broach and burnish round holes in refrigerator hub parts.

Broach splines and hole in automobile bevel gear.

Broach seven external slots in pump rotor part.

Broach jig pads and bolt seats on automotive connecting rods and caps.

Broach involute teeth and cam surface of gear part.

Regardless of how simple or complex your broaching application may be, American can furnish you broaching tools to meet your requirements in part tolerance and finish.

In addition to making all types of broaching tools, American builds broaching machines and fixtures, giving you a well-rounded manufacturing service. American backs up its products with a strong service organization that makes certain broaches, fixtures and machines installed by American will do the job for you.

So why not let American help solve your machining problems. Just send a part print or sample for a free estimate.

Write for Catalog 450. It describes American broaches, machines and fixtures.

AMERICAN

American BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

SUNDSTRAND

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

DOW CORNING CORPORATION

Silicone News

FOR PRODUCTION AND MAINTENANCE MEN

Lead Wire Covered With Silastic* Outlasts Ceramic Insulation 4 to 1; Cuts Costs $17,876 In First Year

The lead wires in the electrically heated heat transfer boilers employed by a mid-western chemical company are exposed to ambient temperatures over 400 F. At this temperature, ordinary cable insulation was out of the question, so the company covered the No. 10 aluminum-alloy wire with ceramic beads, or "fisheyes". But even these could not prevent oxidation and it was necessary to replace the lead wire every 3 months. *(Continued pg.2)*

SALT COMPANY REDUCES MINING COSTS WITH SILICONE ELECTRICAL INSULATION

Increases Power Output and Service Life of Motors

Rock salt, one of our most abundant materials, is also one of the most difficult to mine. Twice as hard as iron or copper ore, it requires tool motors twice as powerful as those supplied with conventional mining equipment. That suggests motors twice as large and twice as expensive to some production men. But to the International Salt Company it means silicone (Class H) electrical insulation.

That's because International has learned from experience in their Detroit (Mich.) mine that motors rewound with silicone insulation produce the necessary power at only a fraction of the cost for extra large Class A or B insulated motors. The 50 hp, 1150 rpm drive motors on the mine's five undercutters, for example, frequently operate at temperatures as high as 375 F. Originally insulated with Class A materials, they used to fail at least twice a year. Rewound with silicone insulation in 1951, they have been operating successfully since.

Similarly, the 2 hp shuttle-wound motors powering dynamite drills have never burned out since being rewound with silicone (Class H) insulation in 1951.

Perhaps the best example of all is the way a 25 year old, 30 hp, 900 rpm crusher motor, recently rewound with silicone insulation, is holding its own alongside three Class B crusher motors, each of which cost several times as much. International men declare that when it comes to putting the pressure on a pile of extra-rocky chunks, the Class B motors can't keep up to the silicone job.

No. 1

Silicone Grease Cuts Oven Conveyor Maintenance Costs; Saves Over $9,500 Yearly On Replacement Parts Alone

The Brake Lining Division of Universal Friction Materials Company, Kendallville, Ind., saves $9,500 a year on replacement parts by lubricating their oven conveyor bearings with Dow Corning 41 Grease. Requiring 640 trolleys, this conveyor system is 853 feet long and makes six 180° turns inside an oven held at 420 F. Its speed alternates between 165 and 260 feet per hour; 5 slow or 7 fast cycles a day depending upon the type of brake band resin being baked. At either speed, the trolley ball bearings are exposed to 420 F, 22 hours a day. And that's where the rub comes in.

Using every known type of grease, even oiling every weekend on overtime, failed to keep the trolley bearings from seizing. Each had to be replaced at least 3 or 4 times a year at a cost of $1.25 per trolley. Whenever a seized bearing jammed inside the oven, production came to a standstill for 7 hours while the oven cooled and the trolley was changed.

The conveyor system also has six pulley wheels located inside the oven. Replacing one of these required 11 to 13 hours and forced the entire shop to shut down. Costing nearly $300 including bearings, shafts and oil seals, replacement wheels were installed about twice monthly. In all, replacement costs for trolleys and pulley wheels averaged well over $10,000 a year.

Then early in 1949, Universal tried Dow Corning 41 silicone grease. Breakdowns dropped off immediately; power required *(Continued pg. 2)*

* T. M. REG. U. S. PAT. OFF.

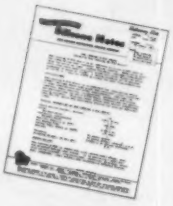
FOR DATA RELATING TO THESE ARTICLES, CIRCLE REFERENCE NUMBER IN COUPON ON NEXT PAGE

MORE

DOW CORNING CORPORATION

Silicone News

DOW CORNING PUBLICATIONS ON NEW DEVELOPMENTS AND TECHNICAL DATA . . .



Motor Repair Shops, featuring Class H insulation made with Dow Corning silicones, are conveniently located in or near most industrial centers. Write for copy of recently revised listing which includes more than 200 such repair shops in 35 states. **No. 5**

▽

"How Silicones Are Licking Tough Electrical Problems." An article summarizing nine years experience under chemical plant operating conditions, proves silicones provide unusual protection, reduce maintenance, save money. **No. 6**

▽

Silicone based water repellent finishes for above-grade masonry walls repel water and water-borne stains; virtually eliminate efflorescence and spalling without plugging the pores or changing the color or texture of masonry surfaces. Easy and inexpensive to apply, such silicone treatments remain effective for years. Over 60 formulators of masonry water repellents made with Dow Corning silicones, are listed in our current "Sources of Supply" **No. 7**

▽

"How to Use Dow Corning 44 Grease in the Bearings of Electric Motors" gives suggestions on lubricating open or single shielded ball bearings, double shielded and cartridge type bearings. The recommendations are designed to increase the life of both bearings and motors. **No. 8**

▽

Dow Corning 6 Compound, a grease-like non-hardening, rust preventative for ferrous alloy metal parts in delicate mechanisms and fine instruments, provides excellent protection during long time indoor or outdoor storage. **No. 9**

▽

"What's a Silicone?" is the title of a 32 page booklet which answers that often asked question in semi-technical terms. Indexed and illustrated, this booklet has earned an international reputation as the most interesting and informative description of silicones ever published. **No. 10**

▽

"Shoe Saver" is a new Dow Corning silicone product recently introduced for industrial use. Easy to apply and economical to use, it keeps leather shoes, gloves and oil guards soft and flexible, preserves stitching, increases resistance to abrasion and heat. "Shoe Saver" lets air in; keeps water, oil and various chemicals from penetrating the leather. AVAILABLE TO INDUSTRY THROUGH SAFETY SUPPLY HOUSES. **No. 11**

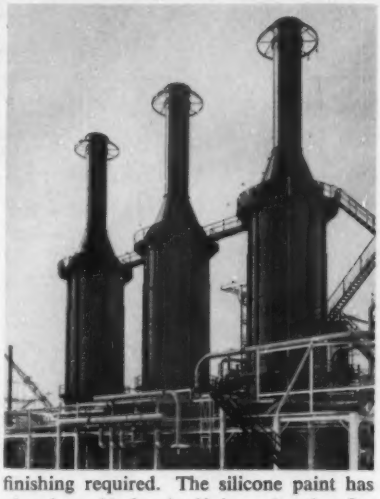
Silicone Stack Paints Last Longer at 700 F

The Cit-Con Oil Refinery near Lake Charles, Louisiana, is one of the newest and largest fully integrated lubricating oil and paraffin wax plants. A joint enterprise of Cities Service and Continental Oil, the plant is finished in sparkling aluminum and gleaming black. What's unusual is that the black is used to protect the surface of such large units as petrochem furnaces and exhaust stacks.

Soon after this modern refinery was completed, it became evident that even the most heat-resistant organic black finishes would not last from one annual unit shutdown to the next. The best of them developed rust stains in a few months.

Then in July 1952, when the steam boiler was down, the three 100 foot stacks in the unit were wire-brushed and a single coat of a silicone resin based black finish formulated by Allied Paint Company of Tulsa, Oklahoma was applied. The coating was allowed to air dry and cure in service. Later the petrochem heater stacks and all other stacks in the plant were refinished in the same manner.

Today, two years later, the black finish is as bright and glossy as ever, despite surface temperatures ranging from 350 to 700 F. Shutdown time has come and gone for most of the stacks with no re-



finishing required. The silicone paint has already paid for itself in reduced refinishing costs.

That's the kind of performance you can expect from coatings formulated with Dow Corning silicone resins. Wherever high temperatures, corrosive atmospheres or both combine to limit the life of organic coatings, silicone based finishes cut maintenance costs, reduce downtime and improve plant appearance. **No. 2**

OUTLASTS CERAMIC INSULATION *(Continued)*

That 150 feet of wire and insulation cost only slightly more than $50 but the tedious "bead-stringing" insulating process boosted the cost to about $550. Replacement required three days downtime, another $600, so the total cost of each failure was $1150. Multiply that by four failures per year. Multiply again by four units in operation. Annual failure costs amounted to $18,400!

When you consider these high maintenance costs plus the value of lost production it's easy to understand why Silastic insulated wire was tried as a solution to the problem. The ceramic insulated lead wire was replaced with Silastic covered stranded copper costing only $33 per unit. Only four hours were required to rewire each unit; total material and insulation costs amounted to $131 per unit.

That was a year ago and the Silastic covered lead wire has been in service ever since. Savings the first year were an estimated $17,876 and the Silastic insulation is still in excellent condition. **No. 3**

CUTS CONVEYOR COSTS *(Continued)*

to pull the conveyor decreased to less than two-thirds of its former rate.

In the more than four years since the first test, a twice monthly relubrication schedule plus an occasional few drops of Dow Corning 710R silicone fluid has produced these results. During that entire time only 1240 trolleys and 2 wheel bearings have failed. Yearly replacement parts costs have dropped from over $10,000 to an average of $500. Installation labor costs have been reduced proportionately. Production has increased substantially. **No. 4**

Dow Corning Corporation, Dept. ER-21, Midland, Michigan
Please send me: 1 2 3 4 5 6 7 8 9 10 11

NAME _____

TITLE _____

COMPANY _____

STREET _____

CITY _____ ZONE____ STATE_____

Silicone News is edited for production and maintenance men by **DOW CORNING CORPORATION, MIDLAND, MICHIGAN**

Branch Offices in: **ATLANTA • CHICAGO • CLEVELAND • DALLAS • DETROIT LOS ANGELES • NEW YORK • WASHINGTON, D. C. (Silver Spring, Md.)**

Canada: Dow Corning Silicones Ltd., Toronto; **England:** Midland Silicones Ltd., London; **France:** St. Gobain, Paris

Largest Producer of: **SILICONE Abhesives • Adhesives • Bonding Resins • Compounds • Defoamers Electrical Insulating Resins • Expansible Resins • Fluids • Greases • Molding Compounds • Paint Resins • Release Agents • Water Repellents • Silastic**

HERE'S WHY LODGE & SHIPLEY BEDS and WAYS ARE STRONG and LONG LASTING

Maintenance men find it easy not to work up a sweat over Lodge & Shipley Beds and Ways. And there are many reasons why:

REPLACEABLE

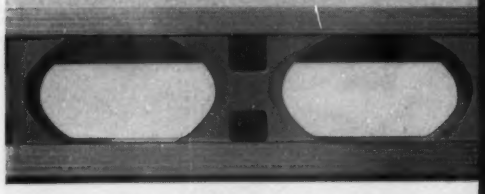
bedways are completely machined and then assembled to the bed. If damaged, they can be replaced in the field, eliminating factory rebuilding.

BED

... exclusive elliptical girth design gives greatest possible resistance to twisting as well as to horizontal or vertical deflection.

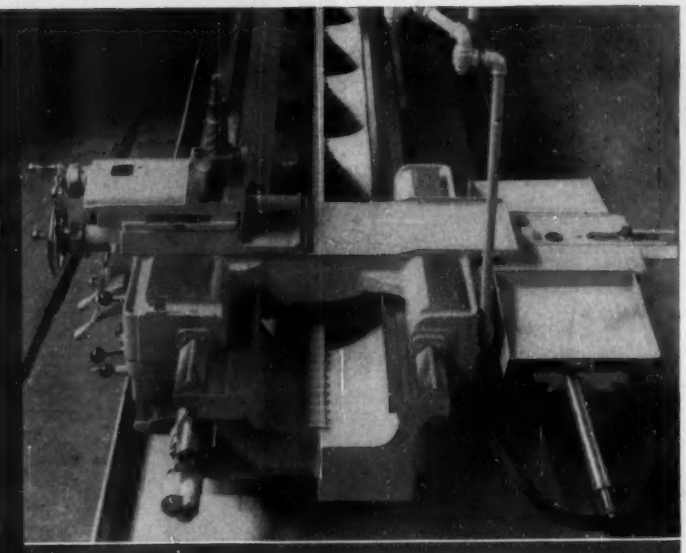
WAYS

... special steel, automatically flame hardened and quenched, then Sub-Zero treated and drawn to Rockwell 60$_c$ hardness ... virtually wear-proofed!

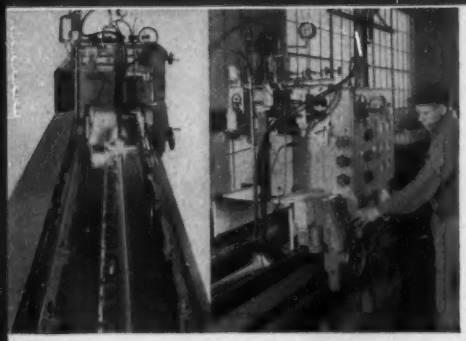


Elliptical girth bed design proved strongest known.

"Deep freezing" makes steel structure stronger, more uniform, and tougher.



Replaceable ways eliminate shortcomings of integral ways.



Automatic hardening and quenching for minimum Rockwell 60$_c$ hardness.

These are just a few of many Lodge & Shipley lathe features. If you'd like more information ... proof that a Lodge & Shipley Lathe is your "Lodg-ical" choice, write for "features" Bulletin No. 200.

THE **Lodge & Shipley** COMPANY

3055 COLERAIN AVE., CINCINNATI 25, OHIO

....your **LODGE-ical** *choice!*

KEMPSMITH
Defiance

HORIZONTAL BORING · MILLING · DRILLING MACHINES

The KEMPSMITH-Defiance line typifies KEMPSMITH leadership in terms of the *first* table-type Horizontal Boring Mill with Outboard Supports as an integral part of every machine. Here is a really good buy for general manufacturing, jobbing, tool and die work, because . . . without any extravagant frills . . . the KEMPSMITH-Defiance provides versatile, dependable, high-speed, precision boring, milling and drilling machine performance. Optional Low Speed Arrangement is an integral part of the head-stock. Massive oversize construction assures accuracy, rigidity and strength for permanence.

The KEMPSMITH-Defiance line is being manufactured initially with 4-inch and 5-inch diameter spindles, powered by 15 HP and 25 HP motors respectively. A variety of Table, Column and Bed Sizes are available to meet your needs. Nitralloy Spindles have Timken mountings.

A complete line of accessories is also available.

Protects hydraulic circuits

ACTUAL SIZE

PUMPS • CONTROLS
MOTORS • PRESSES

Denison Surge Damping Valve prevents hydraulic shock... eliminates damage to fittings, lines, seals and equipment

Sudden starting, sudden release of high pressure into a low pressure area, or reversal of flow causes a hydraulic surge as damaging to a circuit as blows from a hammer.

The Denison Surge Damping Valve converts the hydraulic surge into a smooth, gradually accelerated flow of fluid power. A hydraulically unbalanced reaction flow control in the valve causes the valve to open slower as the intensity of the surge increases.

Lightweight and easy to install, the Denison Surge Valve can be used on any circuit up to 5000 psi. Requires no adjustment . . . interferes in no way with the efficiency of the circuit.

The circuit shows a Denison Surge Damping Valve preventing hydraulic shock when stored-up energy in an accumulator is released. For a bulletin on the surge valve, write to: THE DENISON ENGINEERING COMPANY, 1164 Dublin Road, Columbus 16, Ohio.

DENISON
Hydr**OIL**ics

Carlton *Only one*

Carlton's exclusive 3-unit power-operated mechanical clamping of arm, head and column is easier, faster and costs less to operate

ELECTRO-HYDRAULIC POWER is used to actuate mechanical clamping devices on arm, head and column of Carlton radials. Once any of these units is clamped or unclamped, mechanical devices hold them in position until the electro-hydraulic power is applied again.

Electric power is used only when clamping or unclamping . . . results in noticeable savings in electric power consumption.

The hydraulic pressure required in Carlton electro-hydraulic clamping systems is comparatively low . . . so that there is positively no leakage of oil from any unit. Each unit has its own individual oil reservoir . . . and the oil from the Arm reservoir is used to lubricate the Column.

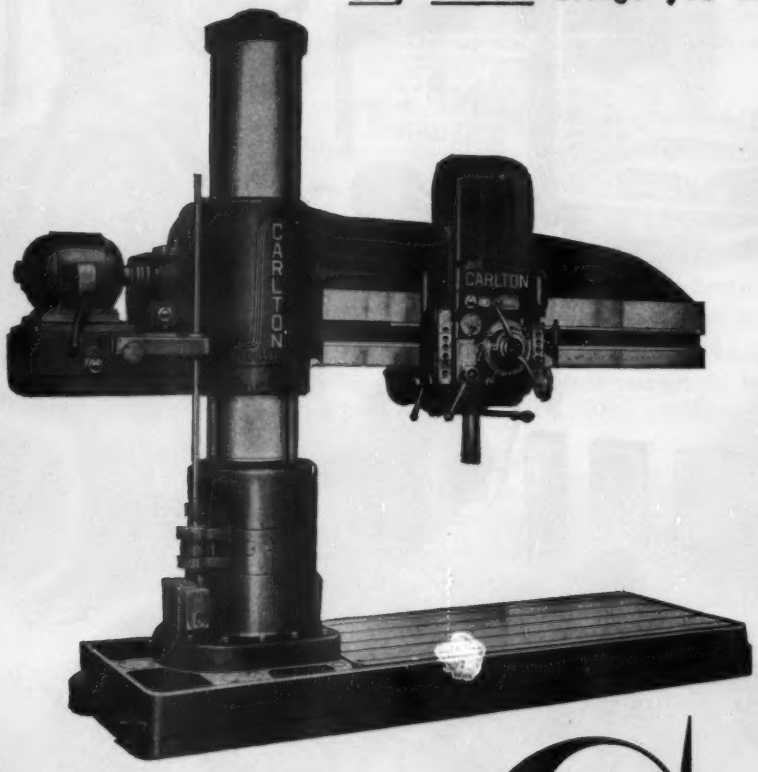
Due to the use of electrical interlocking, overload relays and safety valves, it is impossible to overload Carlton electro-hydraulic clamping systems either electrically or mechanically.

column clamp...arm clamp...head clamp

can be called the finest...

CENTRALIZED CONTROLS:
All controls necessary for quickly and accurately locating the drill from one hole to the next are centralized at the head . . . all located within the spread of a man's hand.

only Carlton brings you all th[illegible] radial drill advantages:



- **CENTRALIZED CONTROLS** (see above).
- **3-UNIT POWER CLAMPING:** column, arm, head (see opposite page).
- **LOW HUNG DRIVE** . . . drives on largest diameter of the spindle . . . permits maximum torq transmission with a minimum of spindle twist.
- **FREE AND EASY RUNNING** . . . thanks to the generous use of tapered and straight roller bearings and ball bearings.
- **EASY TO MAINTAIN** . . . parts jig machined for absolute interchangeability.
- **THE RIGHT RADIAL** for you: select your Carlton from among 5 models, 26 different arm and column sizes. Why not send for descriptive bulletins today?

Carlton

THE CARLTON MACHINE TOOL CO., CINCINNATI 25, OHIO

Call
IMONDS
...he's
SIMONDS
HIGH SPEED
10" - 18T
SIMONDS
HIGH SPEED
12" - 18T
SIMONDS
SIMONDS
SIMONDS
A·B·C
DISTRIBUTORS
Get SIMONDS PRODUCTS

your DISTRIBUTOR the most "Active Partner" your Business can have!

Your business is his business. And he has the practical "know-how" to quickly make himself a specialist in your operational set-up and requirements. Who else can give you such close co-operation . . . and so many valuable services, such as these:

WAREHOUSING: Your Simonds Distributor carries ample stocks that would tie up your own funds.

DELIVERY: Your Simonds Distributor is your nearest and quickest source of supply . . . 24 hours a day.

SIMPLIFIED PURCHASING: Your Simonds Distributor handles your needs for many items . . . all under one order, one bill, one payment.

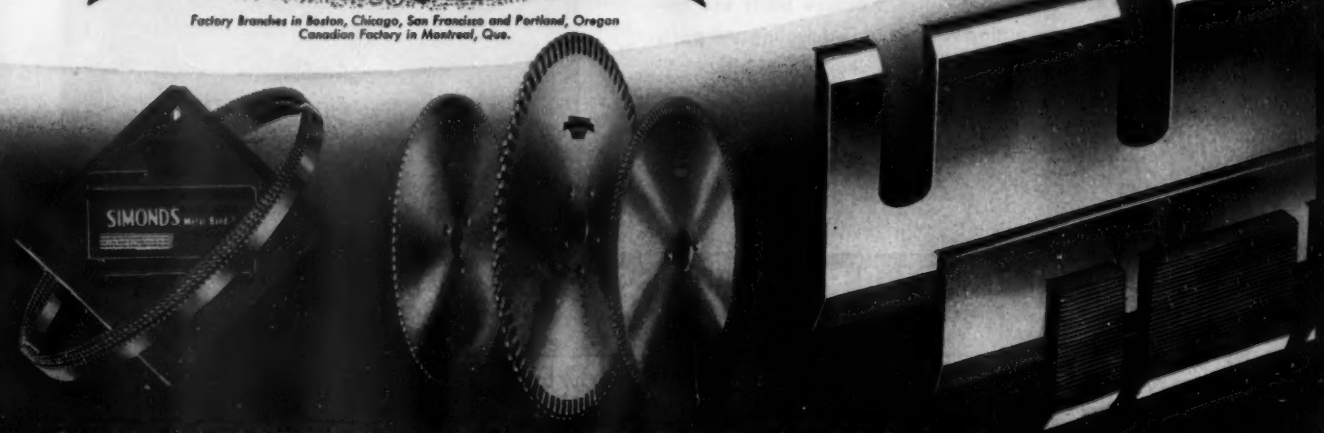
"NEWS BUREAU": Your Simonds Distributor is an endless source of information on new equipment, materials, parts . . . and on new techniques of production, maintenance, engineering.

PRACTICAL KNOW-HOW: Your Simonds Distributor "knows his book" on Simonds Cutting Tools for wood and metal . . . and how to make sure you get the best results out of the best cutting tools made . . . the red-trademarked line that's 100% quality-controlled from steel to finish grinding.

SIMONDS
SAW AND STEEL CO.
FITCHBURG, MASS.

Factory Branches in Boston, Chicago, San Francisco and Portland, Oregon
Canadian Factory in Montreal, Que.

For quick deliveries large or small
Give your Simonds Distributor a call



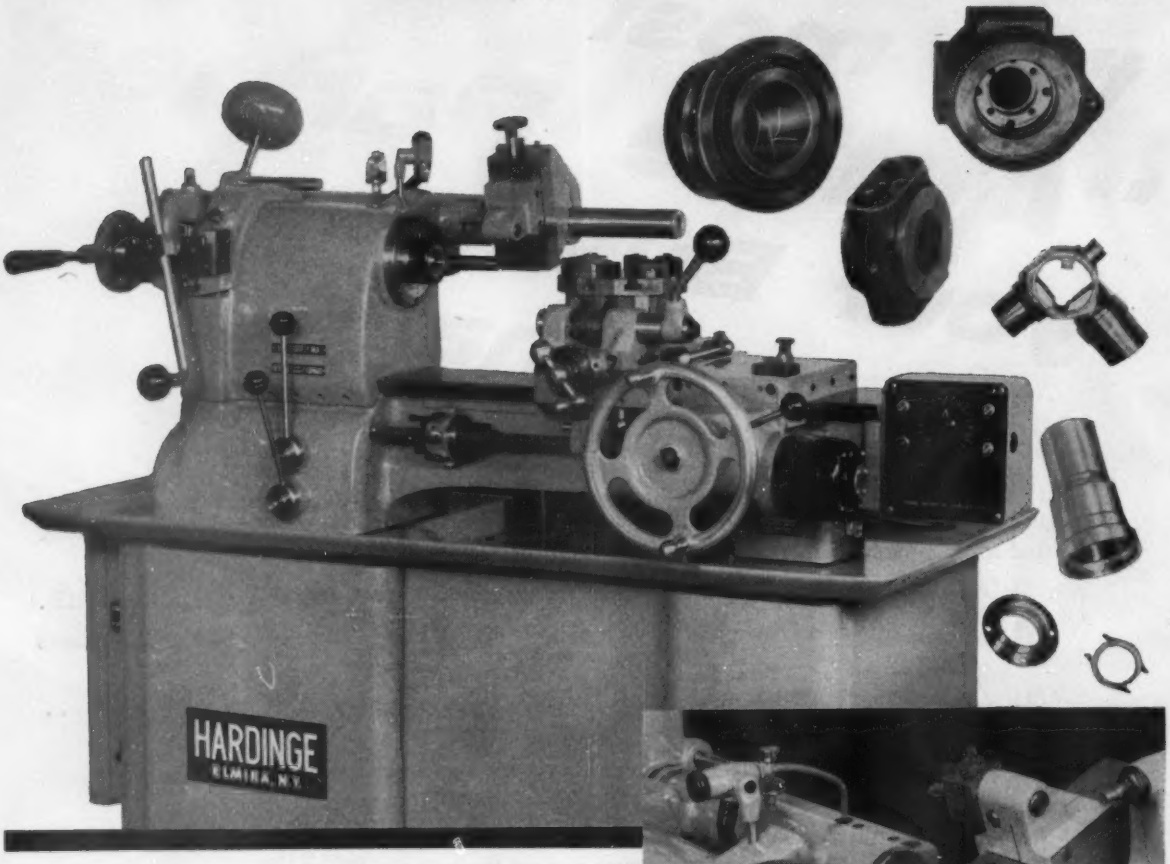
from your Industrial Distributor . . . plus his services that save you Time, Work, Money

HARDINGE
ELMIRA, N.Y.

PRECISION CHUCKING MACHINE

Users say:

"We now get Production with Tool Room Accuracy"



Users enthusiastically tell us how they can easily maintain close tolerances, get better parts finish, and at the same time substantially cut costs . . . when they put Hardinge High Speed Precision Chucking Machines to work.

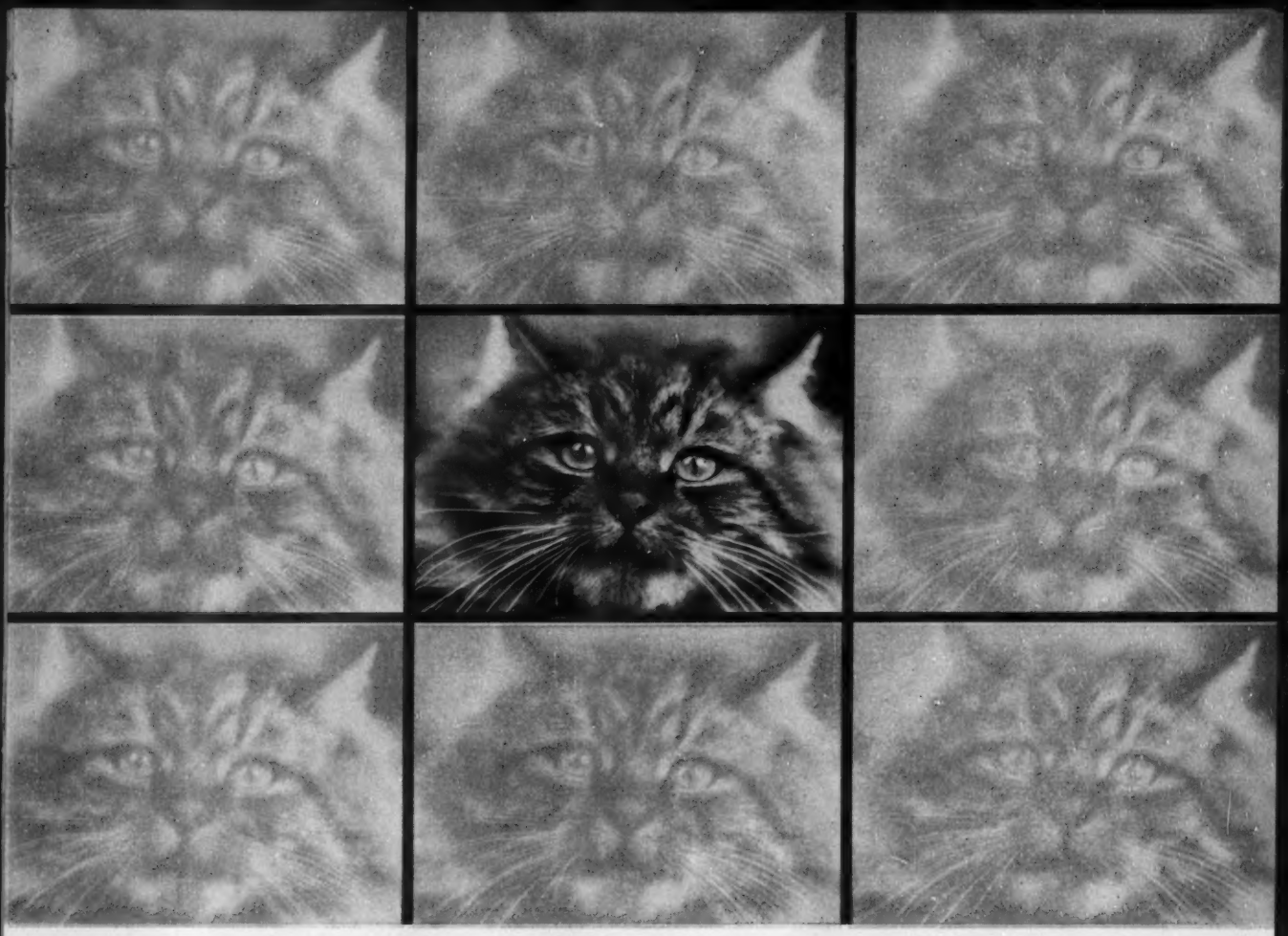
These results are possible because parts are finished in one setting with simplified tooling. All parts shown were produced with standard tool bits.

1" Collet Capacity—6" Chucking Capacity—Write today for Bulletin HC-HCT which presents the whole story.

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE

OFFICES IN PRINCIPAL CITIES. Export Office: 269 Lafayette St., New York 12, N.Y.



How to give TOOLS extra lives . . .

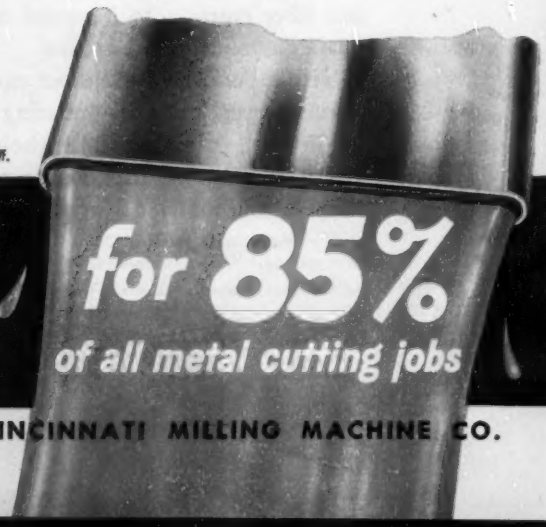
. . . SWITCH TO CIMCOOL,° the radically new and different cutting fluid that increases tool life because it combines friction reduction and cooling capacity in a degree never before attained.

Excessive heat is destructive to cutting tools, shortens their life. But CIMCOOL increases tool life—and permits faster speeds—because this revolutionary coolant cools faster, through a unique physical change in the cutting fluid itself. Tools and chips actually stay cool to the touch.

CIMCOOL is far superior to old-fashioned petroleum-based cutting fluids because it is a *chemical emulsion*. It replaces all water emulsions and all but a few highly compounded specialty oils.

For a demonstration of how CIMCOOL increases tool life—just write us. We'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Or, if you prefer, write for our free booklet, "Cimcool Defeats Heat." Address Sales Manager, Dept. A-94, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

°Trade Mark Reg. U.S. Pat. Off.



CIMCOOL

for 85% of all metal cutting jobs

A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.

NEW

SKIL ¼" DRILL

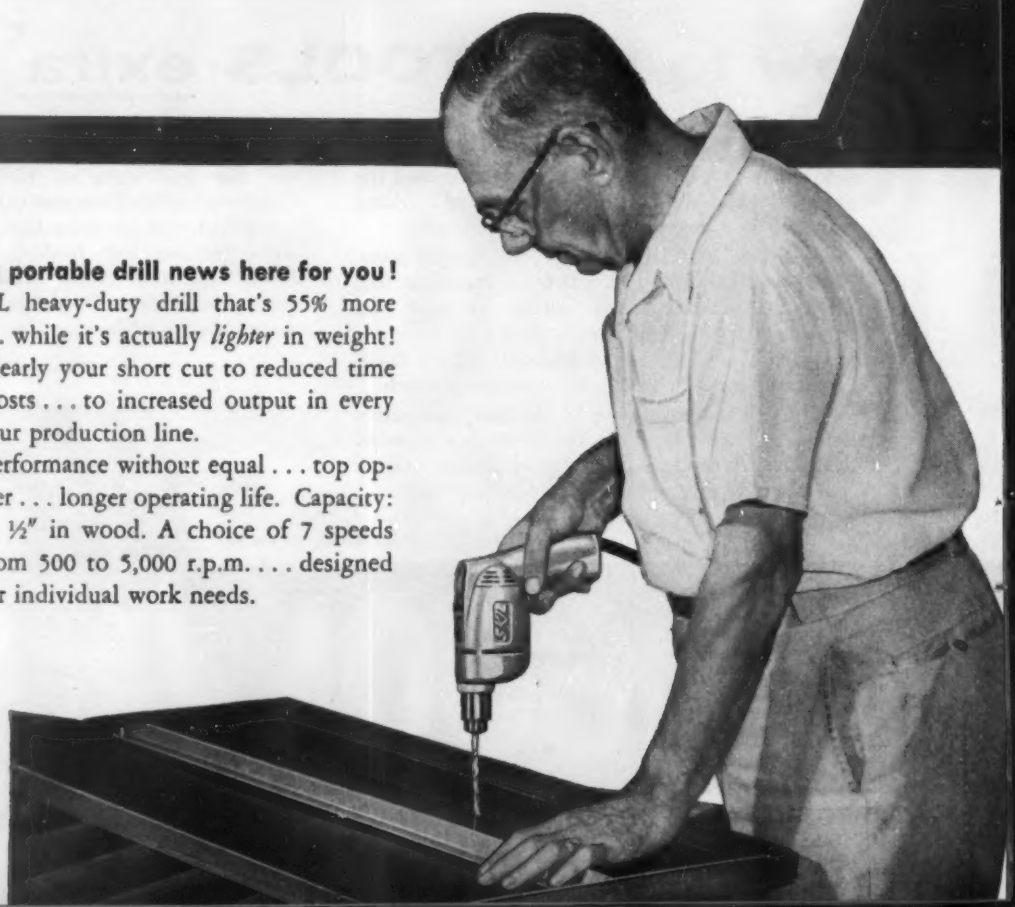
MODEL 75

55% more powerful... yet lighter in weight!

There's big portable drill news here for you! A *new* SKIL heavy-duty drill that's 55% more powerful . . . while it's actually *lighter* in weight!

Here is clearly your short cut to reduced time and labor costs . . . to increased output in every phase on your production line.

Here is performance without equal . . . top operating power . . . longer operating life. Capacity: ¼" in steel, ½" in wood. A choice of 7 speeds available, from 500 to 5,000 r.p.m. . . . designed to meet your individual work needs.



LOOK OVER THESE IMPORTANT FEATURES:

- All anti-friction bearings—for greater efficiency and low maintenance.
- Motor 55% more powerful, yet lighter than previous model.

- Contour-fit handle for easier and more comfortable handling.

- New molded rubber strain relief—protects cord against fraying or breakage at drill cord attachment joint.

- Handy, safety-designed trigger lock for continuous operation—side location for easy operation.

- Larger inspection plate, easily removed for checking and cleaning.

- Convenient chuck key holder on cord.

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For every cutting operation

one cutting oil - GULF

does the job for precision

on every type of steel

LASUPAR

instrument manufacturer

After careful tests on many brands of cutting fluids, the Belock Instrument Company of Long Island, New York, has found that Gulf Lasupar Cutting Oil gives them better performance over their entire range of machining operations on every type of steel they process.

It helps them produce precision instrument parts to extremely close tolerances, with excellent surface finishes and few tool changes.

Gulf Lasupar Cutting Oil has three degrees of sulphur activity—(1) extremely active sulphur held in a stable solution, (2) sulphur combined with mineral oil by a special Gulf process, and (3) sulphur combined with fatty oil. This combination means that you, like the Belock Company, will get better results on those jobs where finish, cutting speed, or tool life is a problem.

Simplify your cutting fluid storage and handling by ordering the oil that will give excellent results over a wide range of machining operations—Gulf Lasupar Cutting Oil. Contact your nearest Gulf office today for further information.

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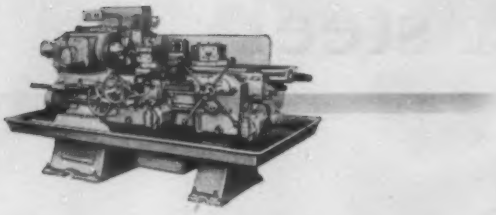
GULF OIL CORPORATION
GULF REFINING COMPANY
1822 Gulf Building, Pittsburgh 30, Pennsylvania



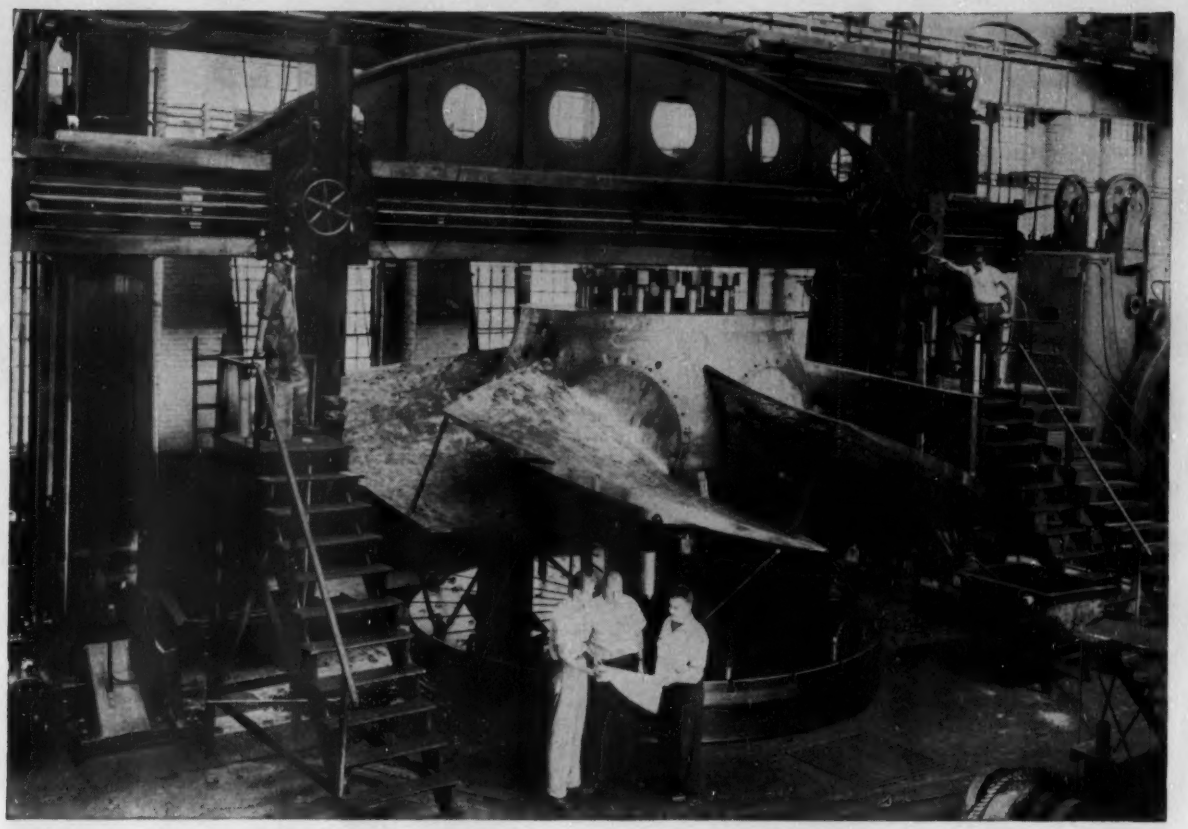
A NEW 3-WAY MARKETING SERVICE THAT HELPS YOU ACQUIRE NEW MACHINE TOOLS

Jones & Lamson's new 3-Way Marketing Service permits you to see ahead . . . and plan ahead . . . without sticking your neck out. This new service offers you a choice of 3 sound methods by which you can obtain new machine tools on terms best suited to your own individual requirements. The three methods: outright purchase; "pay-from-productivity" on a 1-to-5 year basis, at interest rates as low as 3¼%*; or any of 4 variations of a truly flexible lease plan.

*(add-on rate)

JONES & LAMSON MACHINE CO.
502 Clinton St., Springfield, Vermont, U.S.A.

UNIVERSAL TURRET LATHES • FAY AUTOMATIC LATHES • AUTOMATIC DOUBLE-END MILLING & CENTERING MACHINES
AUTOMATIC THREAD & FORM GRINDERS • OPTICAL COMPARATORS • AUTOMATIC OPENING THREADING DIES & CHASERS



Machining 165-ton carbon steel propeller runner, Grade 370 cut heavy scale at three times former speed, with 88% less downtime. Speed—154 SFPM. Feed—1/32 inch. Depth of Cut—7/16 inch.

From on-the-job reports

PRODUCTION INCREASES UP TO 30% WITH NEW CARBOLOY® SERIES 300 STEEL-CUTTING CARBIDES

Case histories, on these pages, prove Grades 350 and 370 outperform other carbides on tough steel-cutting jobs.

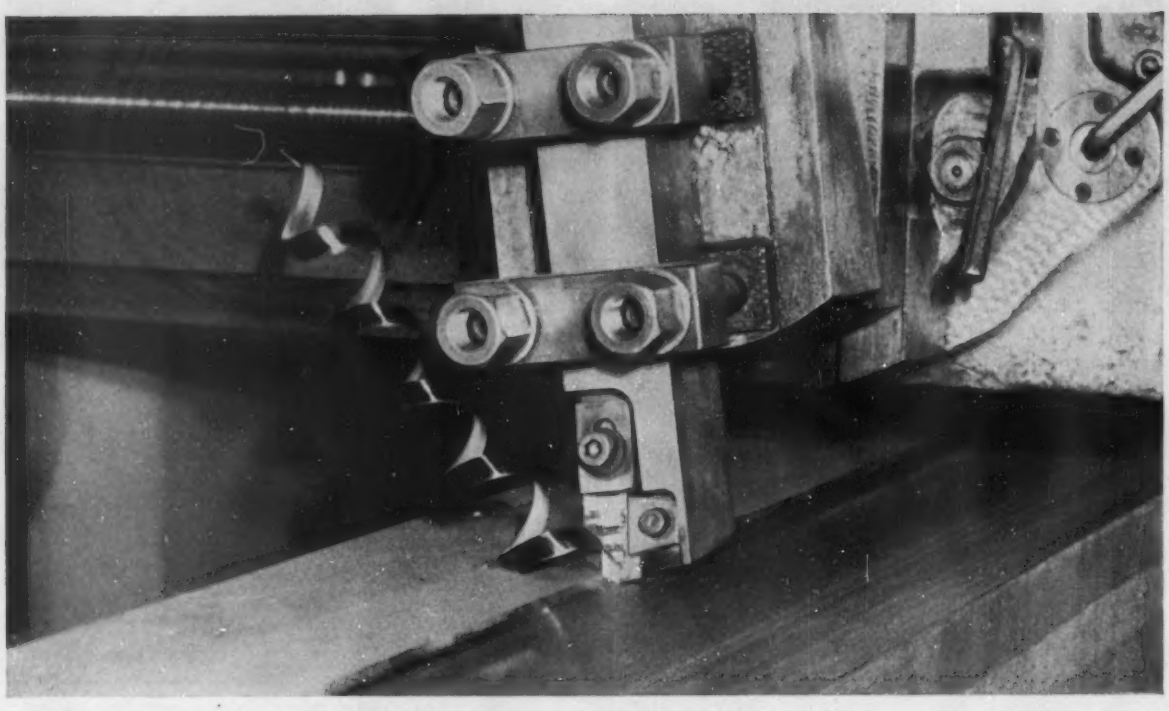
Carboloy Grades 350 and 370 are capable of cutting more cubic inches of steel per minute, with longer tool life, than any other carbides. This has been *proved* on in-the-plant applications, where these grades have boosted production as much as 30% over previous carbides used.

Grade 350 for medium-duty steel cutting, and Grade 370 for heavy-duty steel cutting, are the first of a new family of carbides manufactured by an entirely new process.

Both grades have a built-in structural rigidity that enables them to operate at temperatures as high as 1800°F without the tip deformation found in other carbides. They combine superior wear resistance and extreme toughness to a degree never before possible.

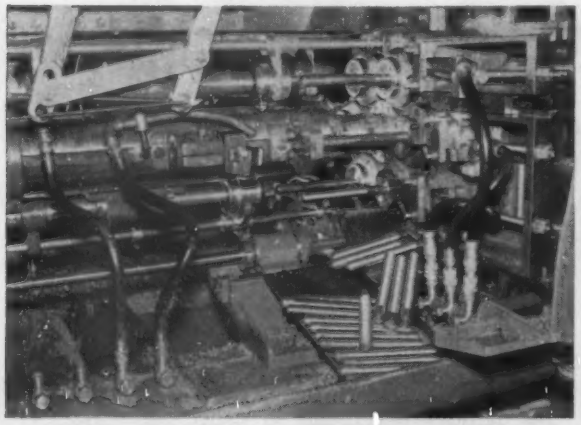
Case histories, operating data on following pages

STEEL-CUTTING CASE HISTORIES WITH



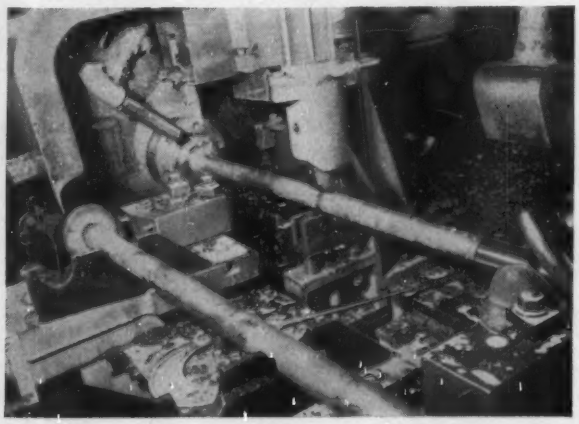
UNDERARM. A single Carboloy Grade 370 clamped-on tip planed all four sides of this normalized steel weldment at 300 surface feet per minute, without regrinding. Despite the large size (12″ x 14″ x 164″) wear on the carbide tip was only 0.010″.

SETUP: Material—1020 steel weldment, normalized. **Speed**—300 SFPM. **Feed**—0.060 inch per stroke for roughing; 0.080 inch per stroke for semifinishing. **Depth of cut**—3/8 inch for roughing; 0.030-0.040 inch for semifinishing. **Coolant**—No.



THREADED LEVELING SCREWS. Carboloy Grade 370 tools, used on 6-spindle Cone Automatic, boosted production to 944 screws per hour, compared to 140 with steel tools.

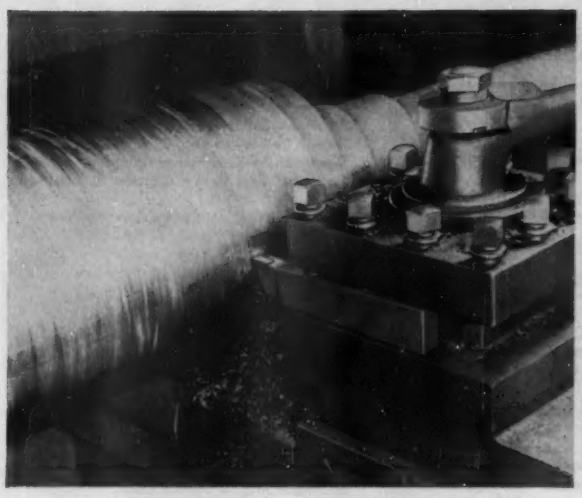
SETUP: Material—SAE B1112 1-inch diameter steel screw stock. **Speed**—1586 RPM for threading. **Feed**—0.005 inch for chamfering and cutoff. **Coolant**—Yes.



TRUCK AXLE FORGING. Turning with Grade 350 resulted in 33% more pieces per tool. Chipping and flaking, encountered with previously used tools, were eliminated.

SETUP: Material—AISI 4150 steel forging. **Speed**—200 SFPM on 2-inch diameter; 400 SFPM on 4-inch diameter. **Feed**—0.014 inch. **Depth of cut**—1/16-1/8 inch. **Coolant**—Yes.

NEW CARBOLOY GRADES 350 AND 370



ELECTRIC MOTOR SHAFT. Carboloy Grade 350 increases the number of linear inches cut by 30% over other carbides used for roughing and finishing this large steel motor shaft.

SETUP: Material—AISI 1045 modified (hot-rolled) with varying heat analysis. **Speed**—300 SFPM. **Feed**—0.020 inch. **Depth of cut**—1/16 to 1/8 inch. **Coolant**—Yes.

JET ENGINE TURBINE WHEEL RIMS. With Grade 370, G. E. got 300% increase in life of tools used for turning, boring and facing cold-worked Timken steel rims. Downtime was reduced two thirds.

SETUP: Material—Cold-worked, forged Timken steel. **Speed**—160 SFPM on O.D.; 110 SFPM on I.D. **Feed**—0.010 inch. **Depth of cut**—1/2 to 7/8 inch. **Coolant**—Yes.

Full stocks now available from Authorized Carboloy Distributors

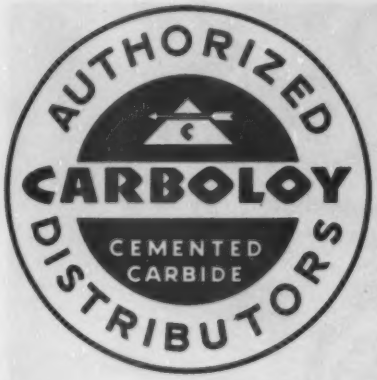
Standard Carboloy Tools are available in Grades 350 and 370. In addition, blanks and inserts of each grade are available in a wide range of styles and sizes.

Carbides for *any* machining job. Regardless of your particular machining problem, a grade of Carboloy cemented carbide is available to handle it. Over a quarter century of experience in machining ferrous and nonferrous, metallic and nonmetallic materials has been acquired by the Carboloy organization. See your Authorized Carboloy Distributor or Carboloy salesman for qualified, expert machining assistance.

Your local Authorized Carboloy Distributor is listed on the next page . . .

AUTHORIZED CARBOLOY DISTRIBUTORS

NATIONWIDE AVAILABILITY AND SERVICE



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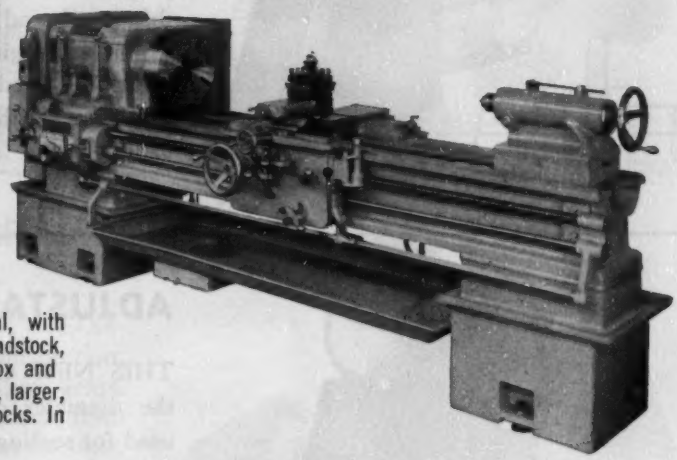
POWER
PRECISION
PERFORMANCE

Nebel LATHES
CINCINNATI

Removable Block Gap Lathes

16″/27″, 20″/30″, 25″/40″ sizes

Nebel removable block gap lathes provide the flexible swing capacity of a gap lathe . . . plus all the advantages of an engine lathe. Made in three sizes, there's one that will fit your requirements perfectly.



Engine Lathes

16″, 20″, 25″, 27″, 32″, 36″ sizes

Now heavier, more substantial, with shaved and hardened gears in headstock, hardened gears in quick change box and apron. Timken anti-friction bearings, larger, heavier aprons, carriages and tailstocks. In short, more lathe for your money!

Extension Bed Gap Lathes

20″/40″ and 28″/50″ sizes

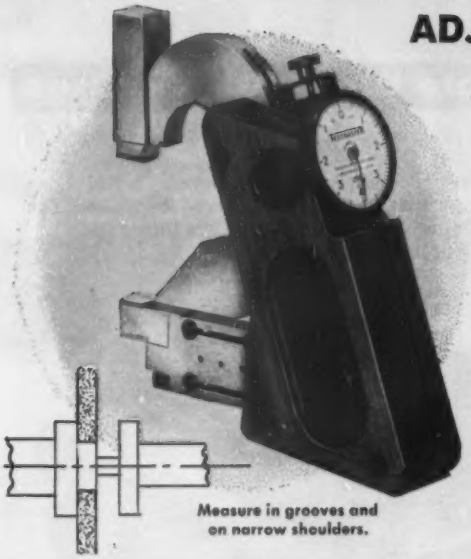
28″/50″ Nebel 'G' series shown, swings 52″ through the gap, 29″ over the ways. Shaved and hardened gears and Timken bearings throughout headstock. Takes 15- or 20-hp motor. Also made in 20″/40″ 'AG' series. Both series now heavier, more accurate, faster and more powerful.

For specifications and further information, see our catalog in Sweet's 1954 Machine Tool Catalog . . . or write

THE NEBEL MACHINE TOOL CO.

3407 Central Parkway • Cincinnati 25, Ohio

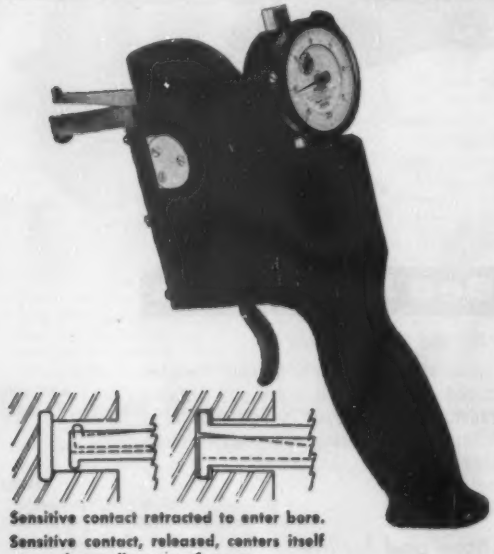
Two NEW gages get measurements IN THE GROOVE!



Measure in grooves and on narrow shoulders.

ADJUSTABLE INDICATING SNAP GAGES 1340 TYPE

THESE ADJUSTABLE SNAP GAGES show *actual* dimensional variations of .0001" because the gage rests on the "solid" upper anvil and the reading is not influenced by the weight of gage nor by the user's hand. The anvils are offset at front of gage and the upper anvil is readily adjustable. When it's locked at the desired position, minor adjustments are made by adjusting the Indicator Dial. The thin anvils and arms of these gages are particularly useful for measuring in grooves, slots, or between close shoulders. Inexpensive, adaptable and totally dependable, these new gages have a thousand uses in all shops — whether small or large.



Sensitive contact retracted to enter bore.

Sensitive contact, released, centers itself at maximum diameter of groove.

ADJUSTABLE I. D. GROOVE GAGE

THIS NEW GAGE IS ADJUSTABLE TO MEASURE the diameter of a wide range of internal grooves as used for sealing or retaining rings. Adjustable to measure grooves between .725" and 2.625" diameter, it enters bores with diameters down to .500". Contacts at the ends of the arms check grooves even at the bottom of blind holes. Because the fixed contact is on lower arm, neither the weight of the gage nor pressure from the operator's hand affects the reading. For the whole story on these NEW gages, write:

FEDERAL PRODUCTS CORPORATION
4129 EDDY ST., PROVIDENCE 1, R. I.

Ask **FEDERAL**

FOR ANYTHING IN MODERN GAGES...

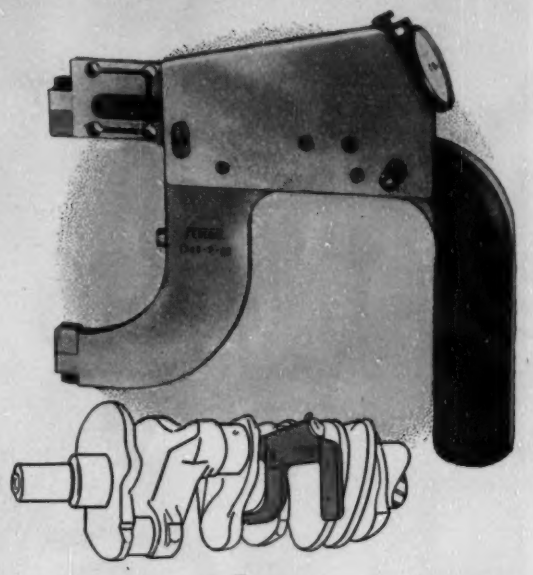
Dial Indicating, Air, Electric, or Electronic — for Inspecting, Measuring, Sorting, or Automatically Controlling Dimensions on Machines

TWO NEW GAGES

TRY 'EM FOR *SIZE* ON TOUGH MEASURING JOBS!

INDICATING CRANKSHAFT GAGE MODEL 1340 P-40

BUILT ESPECIALLY FOR CRANKSHAFT JOBS and similar work, this thin gage gets in between shoulders or close beside bearings and its flat anvils of Tungsten Carbide permit accurate measurements of such critical dimensions. Measurements are transferred from the sensitive anvil to the CONVENIENTLY PLACED INDICATOR through the integrated pantograph unit. Free of all friction, inertia and side play, this unit also counteracts the weight of the gage and operator's hand.



No matter what the position of the throws, Model 1340 P-40 easily measures bearing diameters in the narrow spaces between shoulders of a crankshaft.

PITCH DIAMETER AND SPIRAL GEAR GAGE 202 SERIES

FOR USE IN STATISTICAL QUALITY CONTROL right at the machine as well as final inspection, these gages check pitch diameter of spur gears, helical gears, splines, and chain sprockets. Both upper and lower contacts are of Tungsten Carbide. The upper contact is adjustable for 1" on all five regular sizes and swivels so it seats properly in relation to the lower anvil before being locked in position. The adjustable rear guide positions the gage on the gear, assuring gaging the proper spaces between gear teeth which may be either even or odd in number. For complete information on these new tools, write today to:

FEDERAL PRODUCTS CORPORATION
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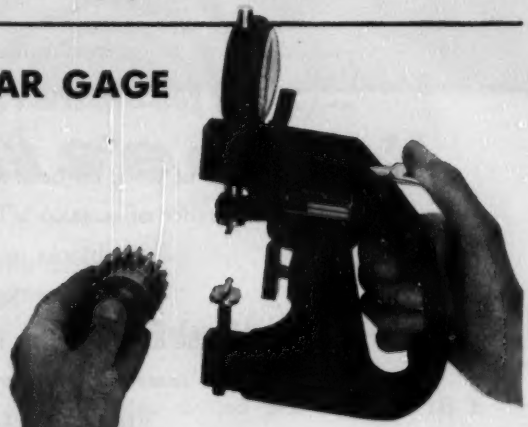


Gear centered properly by rear guide and cylindrical contacts.

Ask FEDERAL

FOR ANYTHING IN MODERN GAGES...

Dial Indicating, Air, Electric, or Electronic — for Inspecting, Measuring, Sorting, or Automatically Controlling Dimensions on Machines

we're blushing with pleasure!

One of our customers, who recently called to order his fourth Blanchard Surface Grinder, made us blush with pleasure.

"It's a shame," he said, "that every machine shop owner doesn't know as much about Blanchards as I know.

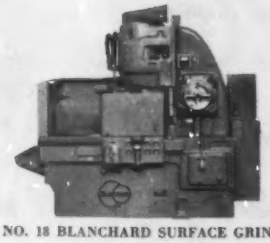
"I use 3 Blanchards almost around the clock in my contract machining business. They make it possible for me to do work much more economically—and in a great deal less time—than my customers can.

"For example, one of my customers had been grinding 1/8" of stock off both sides of 3" x 4" 4140 steel blocks, to a dimension tolerance of ± .0005". The fastest method in his shop involved turning the blocks in a chucking lathe and then grinding them in three operations on his grinder.

"We put the blocks, 17 per load, on a Blanchard and ground them to size . . . ***in exactly the same time that my customer needed to turn 5 blocks before grinding.***

"If you could tell every machine shop owner that story, you'd sell more grinders than you could build."

We're following his suggestion!

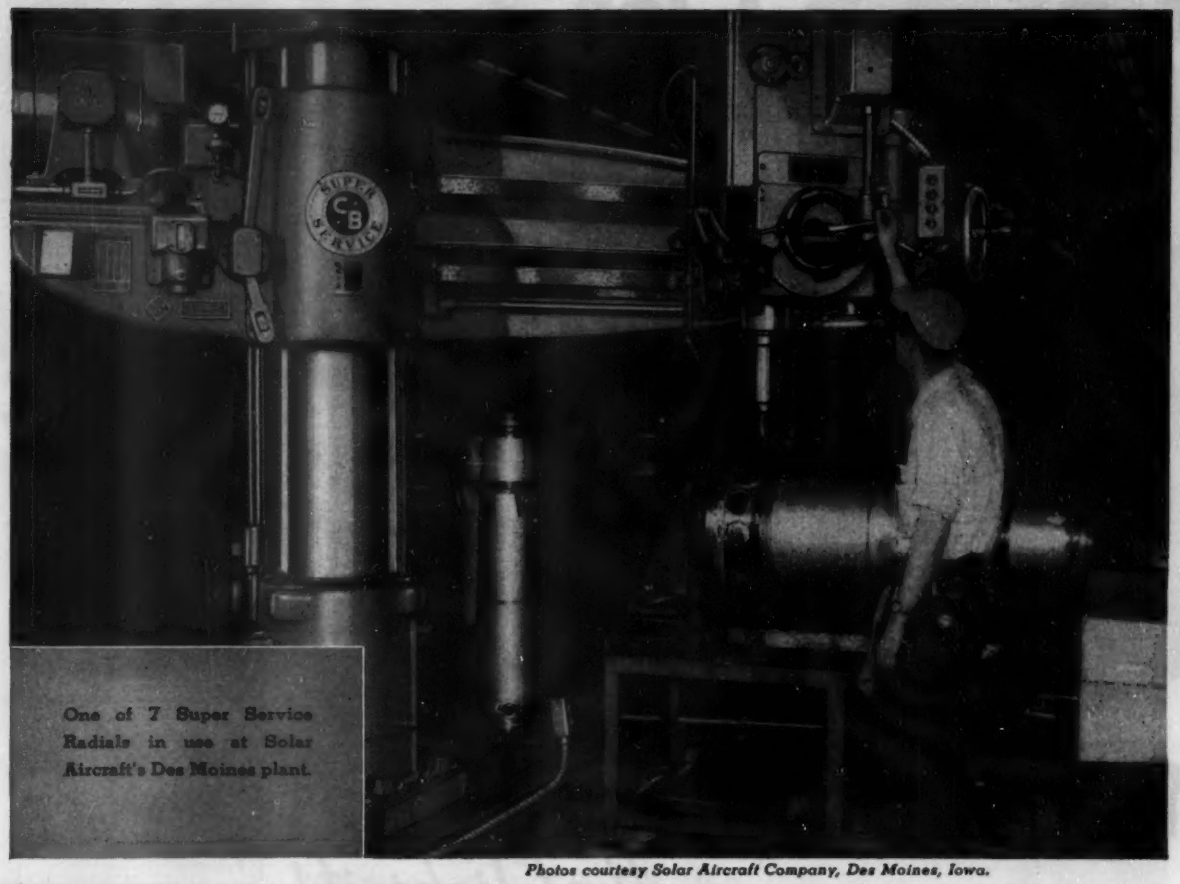


NO. 18 BLANCHARD SURFACE GRINDER

Send for your free copies of "Work Done On The Blanchard", fourth edition, and "Art of Blanchard Surface Grinding"

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY **64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.**



One of 7 Super Service Radials in use at Solar Aircraft's Des Moines plant.

Photos courtesy Solar Aircraft Company, Des Moines, Iowa.

"well pleased..."

"Our production people and our plant engineering department, who install and service equipment, are well pleased with our Cincinnati Bickford drilling machines." • **Solar Aircraft Company**

Both large and small Cincinnati Bickford Super Service Radial Drills are used here in producing jet engine components. The arm of the machine shown above is swinging over two working positions permitting the completion of all drilling operations at both stations with a minimum of work handling. Altogether there are 10 holes drilled and reamed, 18 holes drilled and tapped, and two .656" dia. half moon radii accurately machined in this tough high-alloy steel. The accuracy, speed and trouble-free performance, the power and easy control of these machines have made them popular to both engineers and operators.

Write for Catalog R-29.

80 YEARS OF SERVICE

CINCINNATI BICKFORD

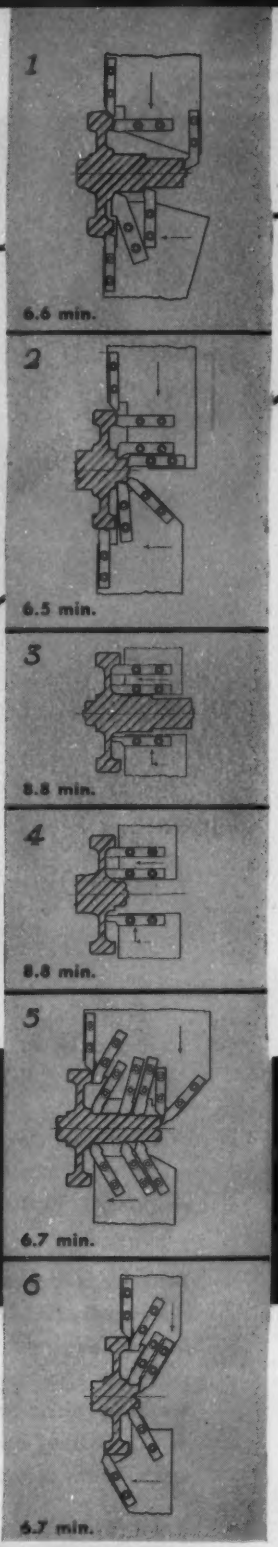
RADIAL AND UPRIGHT DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO.

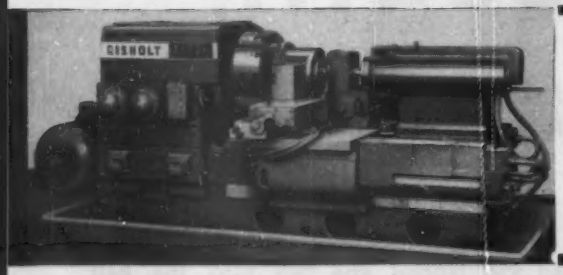
Cincinnati 9, Ohio, U.S.A.

here's A JOB ... *a tough one!*

300-lb. steel forging for final drive gear and shaft—machined in 6 separate operations—at a rate of 1 finished piece per hour.



here's THE MACHINE ... *that licks it!*



GISHOLT
No. 24 Hydraulic Automatic Lathe

Here's how Western Gear Works of Belmont, California, solved their problem:

With two longitudinal carriages and two transverse tool slides, the standard No. 24 machine has the flexibility to combine rapid traverse and feed in several directions. Hydraulic controls make it very simple to change setups.

Now, note how tooling costs were cut by using mounting plates instead of special slotted tool blocks. Large tool bit shanks are slotted, and thus are easily set before final bolting down. The complete riser blocks are quickly interchanged for various operations. And here, again, Gisholt's traditional power and rigidity show up on cuts that pull up to 80 h.p.

For low costs on tough jobs, think first of the Gisholt No. 24 Hydraulic Automatic Lathe. Write for literature.

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

THE GISHOLT ROUND TABLE
represents the collective experience of specialists in machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

Colonial "SUBTRACTING" machines

they subtract production costs ... add to profits

Subtraction #1—the *Broach.* With the Colonial broach designed specifically to broach the part efficiently to the tolerances specified at the required rate of production, cost subtraction starts.

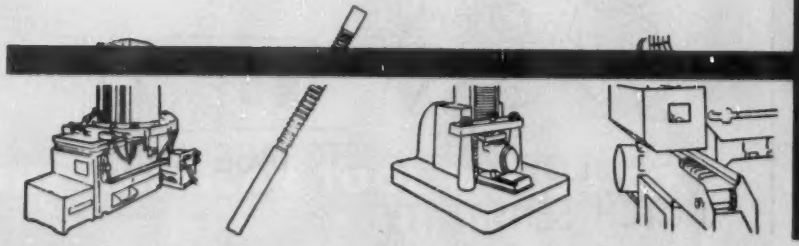
Subtraction #2—the *Machine.* Selecting one of the more than 60 dependable Colonial broaching machines capable of handling the broach at the specified rate of production is the next important step in subtracting costs.

Subtraction #3—the *Fixture.* The Colonial fixture, locating and clamping the part in broaching position, while at the same time permitting maximum accessibility for loading and unloading, is another important step in cost subtraction.

Subtraction #4—the *Automation.* Where high production requirements make loading and unloading time an important factor, the Colonial automation of the broaching installation will serve to further subtract machining costs.

ADDITION—By adding the four important Colonial cost subtracting features above, today's cost conscious metalworking plant has a complete *Colonial Unified Broaching Installation* capable of producing the part at lowest possible cost with utmost accuracy. To subtract costs and add to profits in your plant, ask Colonial Broach to quote on Unified Broaching installations for your parts.

Ask for bulletin 877 on complete line of Colonial broaching machines



Unified Broaching

COLONIAL

Keep Your on the OLIVER Line
— Cost Cutting Production Boosting MACHINE TOOLS

OLIVER DRILL POINTERS

Properly machine ground drills give better performance. OLIVER Drill Pointers, with each lip doing equal work, give balanced cuts—more accuracy—more perfect holes—more efficiency—longer drill life.

As Illustrated:

No. 21 Oliver Bench Drill Grinder. Hand operated for Drills No. 57 to 1/2".

No. 510. For Drills 1/4 to 3"—2 3 4 flute.

OLIVER DIE MAKING MACHINES

Efficient, speedy and accurate — effecting great savings in time and costs. Skilled labor is not required for sawing, filing and lapping operations.

Available in 5 Models.

Bench Model S-1 (Illustrated) — Single Speed Die Maker for use on Tool Steel up to 1" Thick.

Heavy Duty Model (Illustrated) — 6 speeds; works in metal up to 3" thick, has variable strokes to 5" with hydraulic feed.

OLIVER ACE UNIVERSAL TOOL & CUTTER GRINDERS

Keep your most difficult cutters sharp with Oliver ACES. They excel on high speed and Tungsten-Carbide work. Direct reading for clearances reduces fatigue — eases operators' jobs.

The ACE excels for grinding face mills, up to 15" • also, slab mills • slitting saws • all types cutters and reamers.

2 Models: Heavy Duty (Illustrated) and Standard.

OLIVER 20" TEMPLATE TOOL BIT GRINDER

Efficiently powered by a 3 h.p. motor, this OLIVER Machine grinds on the periphery of a 20" wheel. Capacity: tools up to 1 1/2" wide x 1 3/4" high, from 0 to 20° clearance. The OLIVER is developed for production sharpening of single point Tungsten Carbide and high speed tools; offers increased production, lower tool costs and savings in man-hours. Extremely fine finish assured.

Write Today For Complete Information

OLIVER INSTRUMENT CO.

1414 E. MAUMEE • ADRIAN, MICHIGAN

Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

Foundation

The cover of the July 5 '54 issue of *AM* shows a beautiful photograph of the excellent Chambersburg Cecostamp installation, but we were sorry to see that you erroneously credited the design and construction of the mountings to MacIsaac and Menke, who were the contractors.

Actually, Dougles Aircraft, in its California and Oklahoma plants, has over 50 other Cecostamps mounted on Korfund spring-isolated concrete foundations, many of which were installed during World War II. These installations utilize a Korfund patented system, and the steel spring mountings and mechanical snubbers supporting the foundation are designed and manufactured by the Korfund Co. Furthermore, the weight of the foundation and the approximate over-all dimensions are specified by Korfund to provide the predetermined dynamic characteristics of the foundation after each blow.

On this Douglas job, the location of the hammers and the actual construction drawings were prepared by others. MacIsaac and Menke purchased the Korfund Vibration Control materials and obviously did a very excellent job of constructing the pit and the foundations.

Incidentally, this system is so effective that a coin will remain balanced on edge right beside the isolated foundations as repeated maximum hammer blows are struck.

Donald H Vance
Vice President, The Korfund Co, Inc
Long Island City, NY

Long Travel

Last May, I noticed an article in *AM* on a subject that should be of interest to every shop, as it concerns a problem that faces every shop at one time or another: the stretching of table travel on milling machines when the cut required is longer than the normal table travel. The solution shown is particularly important when one bears in mind that a special table with extra travel is very, very expensive and does not give as much travel as the solution you outlined, and which costs only a couple of hundred dollars at most.

I have discussed this vexing problem with several firms, and they were all more than interested and asked me in which issue this article ap-

GRINETICS

By D G SMITH

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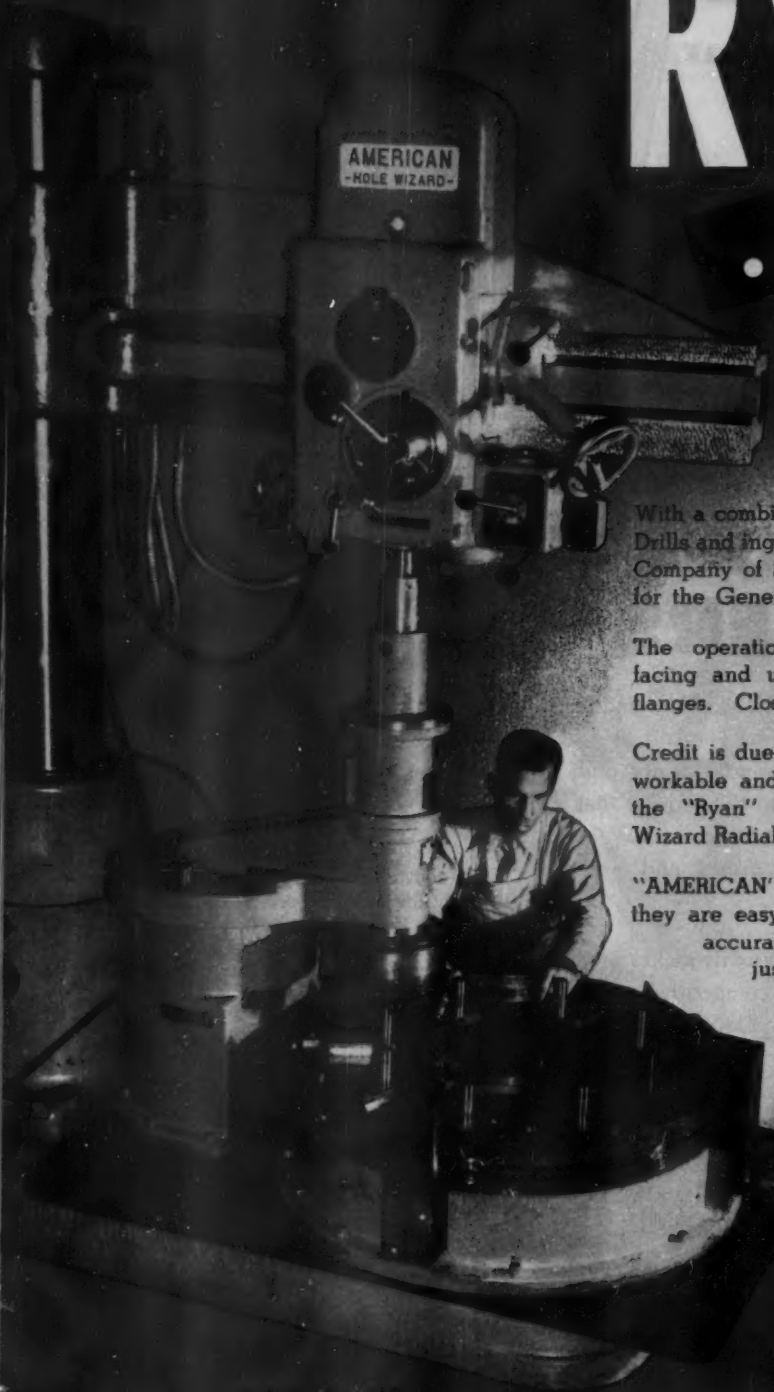
RYAN ...HITS THE JACKPOT!

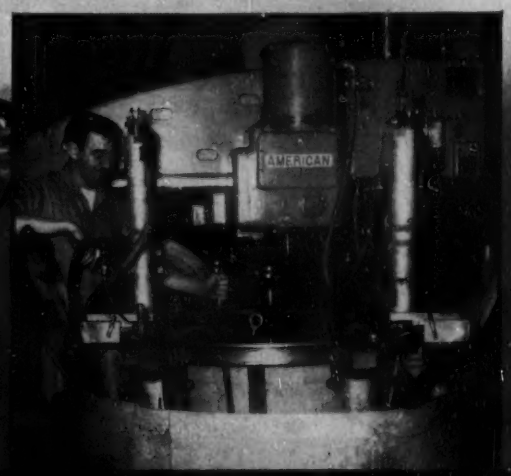


With a combination of "AMERICAN" Hole Wizard Radial Drills and ingeniously designed fixtures Ryan Aeronautical Company of San Diego, California, produces Aft Frames for the General Electric J-47 jet engine in record time.

The operations performed include precision boring, facing and undercutting of the stainless steel support flanges. Close tolerances must be and *are* held.

Credit is due the "Ryan" engineers for developing such workable and time saving fixtures. Credit is also due the "Ryan" officials for selecting "AMERICAN" Hole Wizard Radials as part of the "winning combination."

"AMERICAN" Hole Wizards are sturdy; they are powerful; they are easy to operate and they retain their original accuracy for years to come. For substantiation just ask the operator.

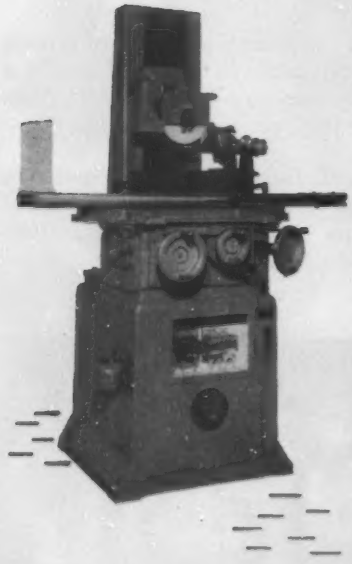


THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

PLAN NOW FOR REPLACEMENT

with REID GRINDERS



It's strictly a dollars and sense proposition. The cost of a new surface grinder is not high in relation to the benefits that accrue from more accuracy, better quality finishes and ease of operation.

And it certainly makes sense, in today's competitive business world to replace older type grinders that invite work-spoilage and rejection.

If you're still using over-age surface grinders, it will be good "insurance" to talk with your Reid dealer today.

He'll show you why modern Reid Grinders will increase efficiency in your toolroom.

see our catalog in MACHINE TOOL CATALOGS or write for copy.

For the full story on Reid Surface Grinders, please write for Bulletin 618-1

Reid Brothers Company, Inc.

peared. Unfortunately, I do not remember the exact issue and, as luck would have it, the files have copies missing. I spent some time in looking for it, too.

I do not get your magazine personally, as my work keeps me moving, but I see it in all shops. Could you tell me in which issue this article appeared? It was developed by some North-Western concern in conjunction with a novel vacuum holding device, and the story was complete with photographs and line drawings.

Carl Raeder
Chicago

The chuck and table were developed at Argonne National Laboratory, and the story appeared in AM*—April 12 '54, pp 210-211.*—Ed.

Draftsmen Beware

My contact with *AM* goes back to 1907 and I will probably go on three years more to become a 50-year reader. I wonder how many more 50-year readers you could muster.

Subject of this letter is the matter of standard drafting practice. You are, no doubt, aware of the current prominence of this subject and of the discussions taking place in some of the mechanical business papers. It is close to my heart because I have specialized in standard-practice-manual editing, and because the intermix of free enterprise and standardization have created some singular results in American products and practices. Drafting practice, for example, was almost a universal standard in 1907.

Why books are published in so many odd sizes does not bother me—it bothers the librarian. That all newspapers except the Chicago Tribune use Webster's Dictionary only mildly annoys me, because I read that paper anyhow. Just why moguls like Columbia and RCA would jettison an industry by departing from standard, to three speeds and two sizes of phonograph needles did bother me greatly—it wrecked me.

A Tower-of-Babel condition has

seeped into mechanical drafting until today's drawings are incapable of interpretation outside the plant of origin. I do not know how much defective drawings contribute to the annual $3 billion of defective products ASA reports. From what I have experienced, ASA figures are too low. I know of shops where losses caused by errors in making or reading drawings vary from 12% by operators rated "expert," to 22% by less skilled operators.

For many years we have had such dictionaries as ASA practice and the nearly parallel MI-STD practice, but these do not present data in manual form, and departures, pet conventions, secret heiroglyphics, and practically no enforcement have robbed the system of merit.

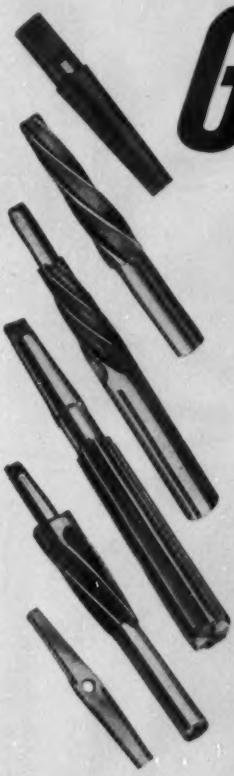
Why bring this up? Well, in a recent article (*AM*—April 26 '54, p101) two old friends, Andy and Phil, write about Oilite. Chrysler is a large concern, should do things right. *AM* is the basic mechanical paper, should also do things right. Since 1926, we have had the ASA standard dimensioning practice, and pages 103 and 104 of the April 26 issue contain dimensioned drawings. On page 103 there are 37 violations of ASA practice, one dimension that goes nowhere, and many decimal points are missing or too dim for my old eyes.

The upper left-hand drawing, p104, must have been made in another drafting room. It contains only 11 violations. Collectively, all are dadblamed sloppy, and back in Cincinnati in 1907, neither Charlie Lauer, Bill Shellenback, Solie Einstein, Ed Blum, Ed Murray, Tom Gibson, Charlie Johannameier, nor other chief engineers of the era could have enjoyed his wienerschnitzel sandwich and seidel of Haucks at lunch until he had fired the draftsman who turned in such a mess.

Geo M Mencke
Wilmette, Ill.

FOR SPECIAL REAMERS . . . REMEMBER

GORHAM



They may not *look* alike, but all of the special tools on this page share a common function . . . *because every one is a reamer!* Each was engineered and manufactured by Gorham Tool Company to provide a practical solution to a specific production machining problem for one of our customers.

Actually, these reamers represent just a few of the many special-purpose cutting tools produced by Gorham. Others include milling cutters and end mills, inserted blade cutters, flat and circular form tools, profile cutters, and carbide tipped tools of every description. Gorham "specials" are turning problems into profits in thousands of plants every day . . . and the one we engineer for you will solve *your* next production machining problem, too! Take advantage of our experience.

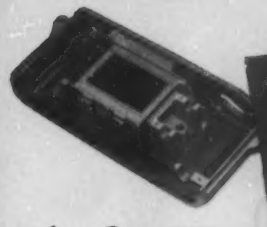
Your nearby Gorham Field Engineer is a qualified cutting tool expert in both practical design and actual application, and his assistance is yours without obligation. Just write for his name, or send details of your problem direct to us. We'll have him get in touch with you promptly.

Gorham TOOL COMPANY

"EVERYTHING IN STANDARD AND SPECIAL CUTTING TOOLS"

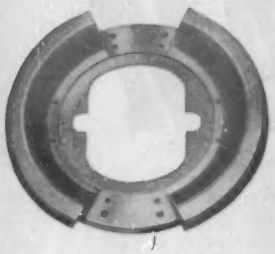
14408 WOODROW WILSON • DETROIT 3, MICHIGAN

WEST COAST WAREHOUSE: 576 North Prairie Ave., Hawthorne, Calif.

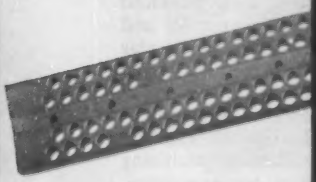


In Plastics

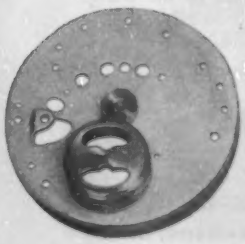
In Aluminum



In Cast Iron



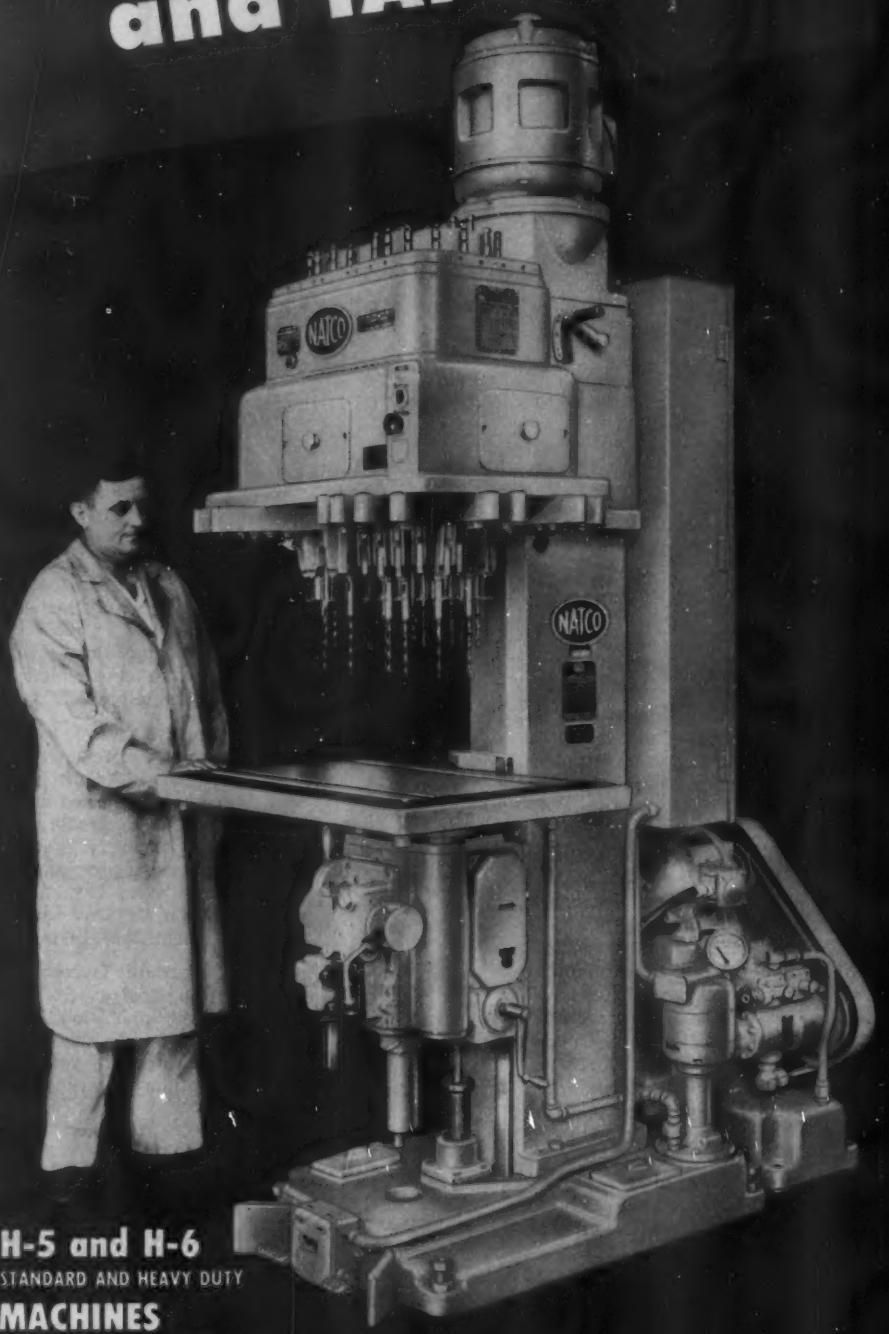
In Wood



In Steel

NATCO

HIGH SPEED SENSITIVE MULTI-DRILLERS and TAPPERS

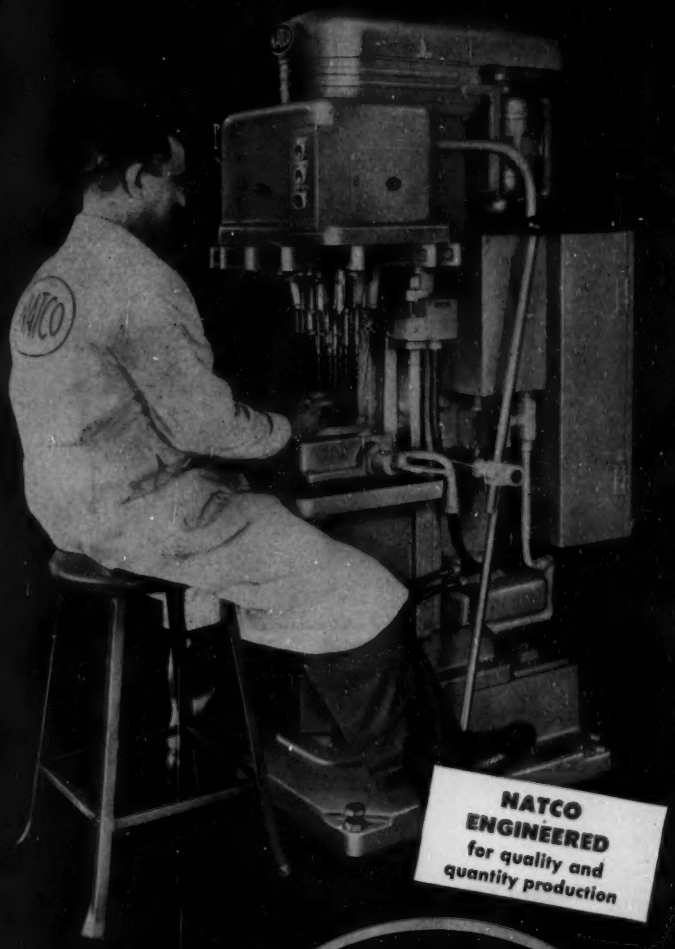


H-5 and H-6
STANDARD AND HEAVY DUTY
MACHINES
(H-6 Machine Illustrated)

...REDUCE COSTS WITH INCREASED PRODUCTION OF SMALL PARTS!

The NATCO Model B-33 light, sensitive multi-drilling and tapping machine shown at right is available in three feed arrangements: hand and foot feed or combination hand and foot and air-oil feed; and air feed. These machines have adjustable spindle arrangement for different work set-ups and a large working table. They offer maximum production on light work where super-sensitive operations and high speed are important.

NATCO H-5 and H-6 high speed sensitive multi-drillers and tappers are furnished in standard and heavy-duty models with adjustable multi-spindle, fixed center spindle or slip spindle type heads. They are provided with change gears and quick change speed mechanism for correct spindle speeds. They will efficiently handle a wide range of small and medium-sized work and make possible multiple drilling or tapping of small holes at minimum cost.



B-33
LIGHT, SENSITIVE
MACHINE

NATCO ENGINEERED
for quality and quantity production

Call a Natco Field Engineer

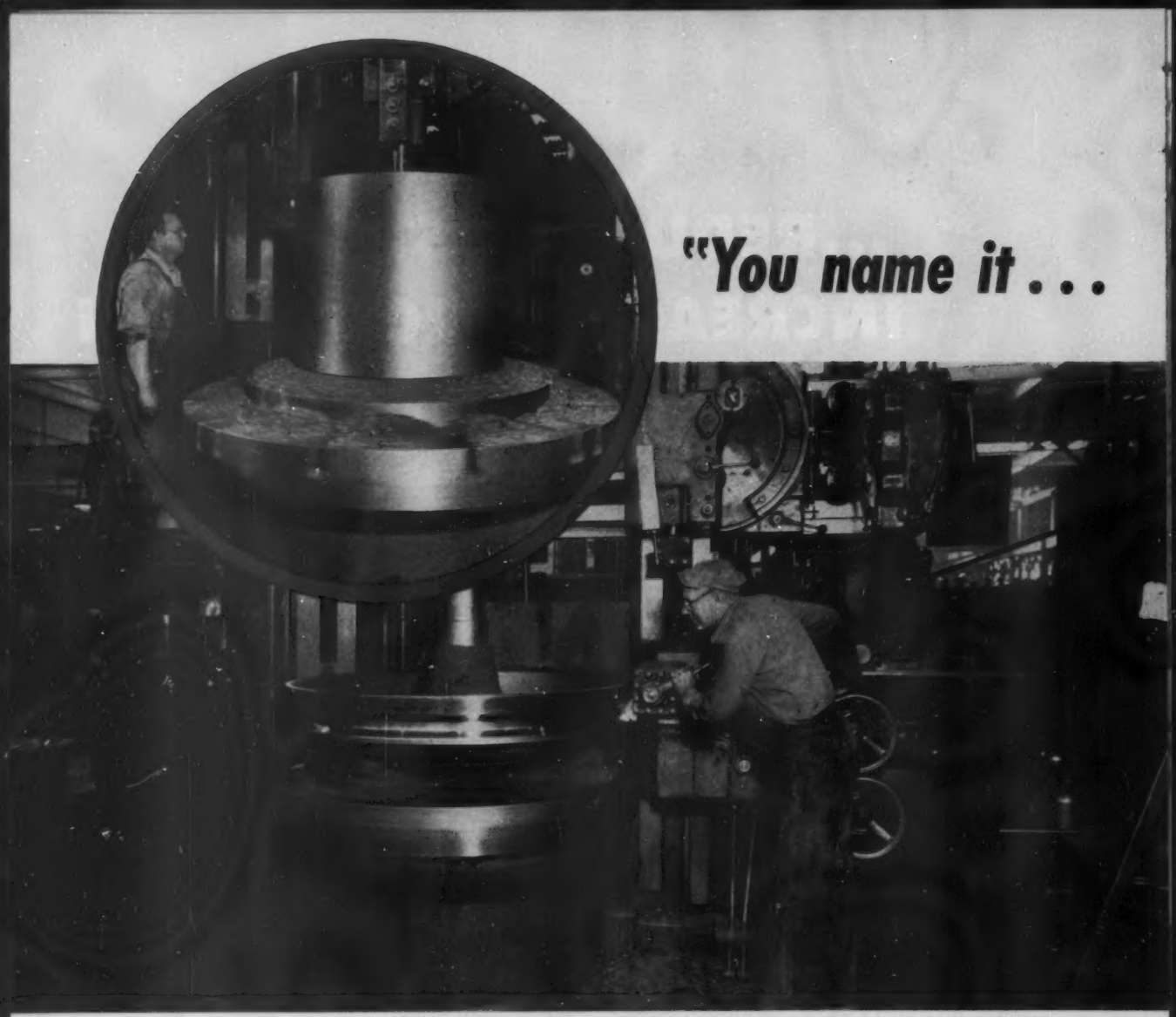
to help you solve your problems in Drilling, Boring, Facing and Tapping

NATCO

NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Indiana

Branch Offices

CHICAGO: Room 203, 6429 W. North Ave., Oak Park • DETROIT: 10138 W. McNichols Rd.
BUFFALO: 1807 Elmwood Ave. • NEW YORK: 35 Beechwood Ave., Mount Vernon



"You name it . . .

KING does it"

. . . at BELOIT IRON WORKS

Rugged KING® Vertical Boring & Turning Machines are noted for their durability, precision, and versatility. For example—at Beloit Iron Works, Beloit, Wisconsin, KINGS are called upon for *versatility plus* in machining grey iron castings. "Jobs run the gamut from light to heavy, large to small," says this customer. "There's boring, turning, facing, forming . . . taking light cuts, interrupted cuts, heavy cuts. In a word, we find that with KING machines it's a case of *you name it—King does it.*"

It will pay *you* to get first-hand information on the wide variety of precision work that KING machines can handle in your production. You, too, will find that in range of feeds and speeds, in ease of control, in extra weight and accuracy-maintaining rigidity, KING will meet *all* job requirements at a *profit.*

KING machines are available in ten sizes—30" to 144"—the widest size range in the field. See your KING distributor, or write us direct, for details.

AMERICAN STEEL FOUNDRIES

KING MACHINE TOOL DIVISION

Vertical boring & turning machines . . . 1150 TENNESSEE AVE., CINCINNATI 29, OHIO

Spot News of Metalworking...

- **GLASS-FIBER-TO-METAL BOND . . .**
  Navy Ordnance has developed a new structural material that will bond metals to glass fibers, or glass fibers to resins and inorganic materials, to produce laminates and tubular materials of exceptional strength. Advantages reported: resulting material is suitable for higher temperatures than any existing glass fiber structural material, improved strength-weight ratio, high corrosion resistance.

- **FLEXIBLE GRINDING MATERIAL . . .**
  A Norwegian firm is marketing a grinding and polishing material woven from fibers spun from steel and jute that will grind and polish iron, steel, stainless, brass and other metals, as well as glass and wood. Cloth is extremely soft, will not harm surfaces, and can be woven to fit varying applications.

- **JET-AGE APPRENTICES . . .**
  Pratt & Whitney Aircraft is starting three-year apprentice training courses for jet-engine metalsmiths and machinists. Top machinist graduates will go on to specialized courses in tool and die making.

- **TITANIUM FROM JAPAN . . .**
  A Tokyo firm has come up with a process for refining titanium dioxide with metallic calcium that yields titanium powder of 300-400 mesh. Firm is producing 1.5 tons a month, plans to sell it in the US for $6.50 per lb. Offshoot of the process is a 95% aluminum—5% titanium alloy that is said to achieve better heat and erosion resistance in surface treatment of steel than aluminized steel.

- **JET AIRLINER . . .**
  Douglas Aircraft has revealed that it has already spent $3 million and 250,000 engineering man hours in developing its DC-8 jetliner, which will cruise at 550 mph, have good low speed and stall characteristics, and a 30° sweepback angle.

- **WOOD BEARINGS . . .**
  Viennese scientists are producing bearings from birch, aspen or alder wood that are claimed to withstand wear better than bronze in some applications. Process involves cutting the wood into small cubes, steaming them, then compressing them to 50% of original size in heavy presses. Blocks are dried 5-6 days, then glued together with water-repellent materials, and machined to shape and size.

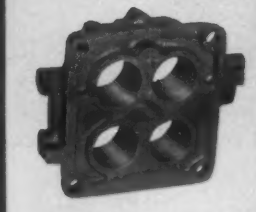
- **FREE-PISTON GAS GENERATOR-TURBINE . . .**
  GM's Cleveland Diesel Engine Division has been authorized by the Maritime Administration to produce a free-piston gas generator-turbine for US merchant ships. Its prime advantage: combines the high thermal efficiency of the two-stroke diesel with the flexible power take-off of the turbine.

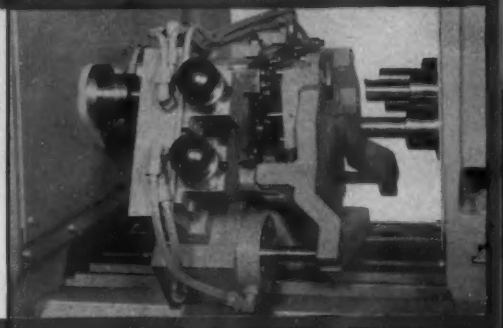
- **RUSSIAN VS US ENGINEER TRAINING . . .**
  America is running a poor second to Russia in turning out engineers. That's the finding of National Research Council's two-year study of training methods, reported at ASME's fall meeting. Proof? Russia has upped its engineering graduates from 29,000 in 1948 to 50,000 this year. US total for 1954: 19,000. (see p 156).

To Meet Today's Price-Competition Modernize with Ex-Cell-O Machines

Standard Precision Boring Machines for Close-Tolerance Work at MAXIMUM PRODUCTION SPEEDS

Style 1212-A Precision Boring Machine equipped with spindles, drive mechanism, and universal fixture. Like all other Standard Ex-Cell-O Boring Machines, it can be tooled with special fixtures for high production runs.





TYPICAL TOOLING: Cast-iron body-flanges for a new 4-barrel automotive carburetor require accurate bores. The four holes are 1⅜" diameter, *bored to plus-or-minus .0005"*. It's done at *maximum production speeds* on this standard double-end Ex-Cell-O 1212-A Precision Boring Machine using a simple fixture holding two parts.

Ask your local Ex-Cell-O representative for more information or write for Precision Boring Catalog.

XLO
EX-CELL-O for PRECISION

The four holes are so close together that they cannot be bored simultaneously. So two holes in each part are machined by spindles at left; then, two holes in each by spindles at right. With minor changeovers, this same fixture handles similar parts of different shapes.

EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

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54-13

Washington . . .

Washington has slashed its spending plans for the next nine months—mainly in defense buying. Reasons: an anticipated drop in revenues, a jump in deficit estimates. The January estimate spelled out Defense Dept spending at $37.6 billion in fiscal 1955. The new estimate made this month shows planned expenditures of $35.5 billion—a $2 billion drop.

The big cut will come in hard goods buying—planes, ships, vehicles, weapons, ammunition. Aircraft spending, for example, will be about $400 million less for the year than estimated last January. This comes almost wholly from programs that haven't panned out at the production level. Nine months ago, for instance, the Pentagon expected the new Sapphire jet engine to be produced in vast quantities this year. Now officials know otherwise.

Ship procurement is cut $80 million from January. A cut of almost $800 comes from Army materiel like motor vehicles, spare parts, and "shelf" items now considered surplus. In all, hard goods buying will now amount to $13.2 billion for the year. That's way below $15.6 billion spending in fiscal 1954, $17.1 billion in fiscal 1953.

• • •

This is what's behind the cut in spending plans: Last January, tax revenue for the current fiscal year was pegged at $62.7 billion. Now the outlook is for no more than $59.3 billion. Part of this revenue drop stems from the $1.1 billion reduction in excise taxes ordered by Congress. The balance comes from a drop-off in business tax returns.

• • •

Pentagon will step up contracting sharply, though, during the next 12 months. Budget Secretary McNeil forecasts that military orders to be placed during the year ending next July 1 will be around $17 billion. This compares with orders during fiscal year 1954 of about $9.2 billion.

The drop in contracting last year resulted partly from the accumulation of hard goods that had been ordered to supply the Korean war—and later the so-called "New Look." Wilson's new team put a virtual stop to contracting for many items during December through February, and forced contractors to reduce lead times on the long lead-time items.

• • •

New orders for planes, ships, guns, and other hard goods will be placed at a fast clip beginning in the next few weeks. The plan now is to place orders at a $16- to $18-billion level per year from now into the foreseeable future.

The biggest increases in new orders will be for new weapons—guided missiles, particularly. Actually, orders for aircraft as such aren't expanding anywhere near as fast. But for the aircraft industry as a whole, the new procurement for missiles makes up for any gap that might exist. The outlook for the aircraft industry is just as bright as it ever was.

• • •

New orders for ships and related equipment will be larger during the next 9 months. There will be new contracts for carriers and for submarines.

New orders for Army equipment, however, will continue to slide off. There will be almost nothing for tanks and vehicles. Ammunition stockpiles are in good shape.

• • •

The government's proposed new elephant tool program has hit a snag. Officials in a position to hold the reins on the program are skeptical about it. They say the proposal to stockpile elephants may fall flat because of the lack of firm military requirements that would be needed to justify money allocations under the Defense Production Act borrowing authority. But BDSA's metalworking equipment division is still trying to work up details on a program that could be approved. BDSA plans to make specific recommendations on tools to be bought, where to install or store them, and under what conditions. The agency is exploring various schemes. But officials are reluctant to talk about them at this stage.

• • •

The biggest potential source of new government machine tool business is the proposed program to expand capacity for a vast range of industrial components needed for defense—mostly to be kept on standby. But like the elephant tool plan, this too is still in the drafting-board stage.

• • •

FOA Chief Stassen has come up with a compromise on the controversial purchase of 100 steam locomotives and 5000 freight cars, which may set the line for future foreign aid procurement. He will place half the orders with foreign firms making low bids, half with US manufacturers whose bids were almost twice the foreign bids.

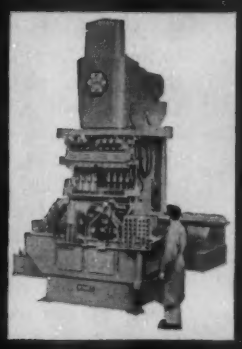
In the past, FOA contracts were placed solely with low bidders—whether foreign or domestic. From here on out, US manufacturers in a labor surplus area or in a distressed industry may be able to get a chunk of FOA business even if their bids are way over low foreign bids. Says Stassen: "FOA is not a cold mechanical bid-letting organization." Political and economic factors must be considered, too.

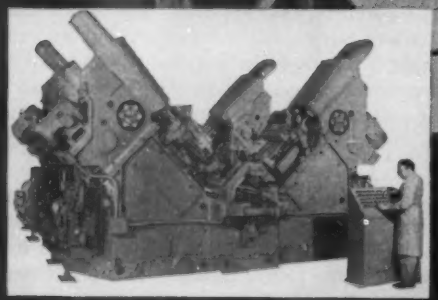
FOR

Production • Accuracy • Economy

V-8 Cylinder Blocks are MICROHONED Automatically on NEW Model 420 Hydrohoners ☆

Specifications of this model are included in our general catalog—obtainable at the offices listed below.





This multiple-spindle, heavy-duty model is designed to fit any type of production line. Examples of its adaptability: above, two four-spindle machines with tip-up fixtures; left, V-type; upper right, eight spindle vertical.

1929 • 1954 — PRECISION PRODUCTION THROUGH MICROHONING — MICRO MATIC — TRADE MARK — 25TH YEAR OF DEVELOPMENT

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Detroit . . .

Square D Co's attempt to break the strike which the independent United Electrical Workers Union called in mid-June appears to have fizzled out.

This was the first strike-breaking effort by a Detroit company of important size since pre-World War II years. The company opened its gates early in September after the UE refused absolutely to accept a no-strike clause demanded by Square D.

Management charged that the UE sanctioned 99 illegal work stoppages during the previous two-year contract. It said it could not continue to operate in Detroit if its 1200 employes persisted in walking out with such frequency. Plans to build a new plant in a Detroit suburb were abandoned.

At one point, about 150 supervisors and 250 workers were crossing picket lines. Minor acts of violence occurred outside the plant and up to 150 policemen were stationed in the area.

A communist theme was introduced by a Congressman, who charged that the strike was being push-buttoned by commie elements outside of Detroit. For a few days, the red stigma served to keep other unionists out of the UE-Square D fight. Police warned Ford Local 600, itself a local that has had more than a sprinkling of communists in its top echelon in the past, to keep hands off the Square D strike.

However, CIO's United Auto Workers soon took an official stand: UAW criticized the company for ducking responsibilities and permitting communist exploitation.

Union locals interpreted that as a signal to aid the strikers, and workers from Ford, Budd, Dodge, elsewhere, began showing up on picket lines. UAW also officially invited Square D employes to get "into the mainstream of the American labor movement" by joining CIO's Electrical Workers.

At mid-month, Square D and UE were talking contract again, while a circuit court judge sat in as a peacemaker. If a settlement is reached, the turbulent situation probably will not be fully quieted for a good many months. Reason: IUE organizers will be actively trying to take over UE's last Detroit stronghold.

• • •

A year ago, General Motors acquired Euclid Road Machinery Co and brought it into the GM fold as Euclid Div. The company's annual sales were about $50-million. It held about 75% market penetration in off-the-highway bottom and rear dump equipment and 10 to 15% of the scraper market. It had doubled its plant space in 1947, again in 1950 and again in 1952.

In the year since it added Euclid to its string, GM has: tripled Euclid's engineering staff, designed and produced a few models of the revolutionary TC-12 twin crawler (which has twin diesels and two separate drive and track assemblies, which are free to oscillate on a seven-inch transverse shaft), designed and produced three new scrapers, doubled Euclid's plant space by transferring to it the Electro-Motive plant in Cleveland, made all of its enormous facilities available to the division and, lastly, set out to increase Euclid's sales two-and-a-half times by 1958.

• • •

One thing Studebaker-Packard officials seem to have plenty of is optimism. Said a Packard executive recently: "I think we (Studebaker-Packard) can expect to take 5% of total industry sales next year." So far this year, the two automakers are accounting for less than 2% of the total. Last year, their combined share was about 4.3%.

One of the companies S-P is thinking of acquiring is Ionia Mfg Co, a division of the Mitchell-Bentley Corp. Ionia produces certain auto bodies and trim, other items.

Packard officials were miffed, incidentally, by published reports that the company would install a torsion-bar suspension system on its 1955 autos. Reason: cost studies have not yet been completed. A spokesman said the company may yet find torsion bars to be so expensive as to preclude installation.

• • •

Fragmentary reports that some of the gloss on the Cadillac market is rubbing off in some areas is not reflected at all in the automaker's production schedule. At the beginning of the 1954 model run, management said Cadillac would shoot for 117,000 units this year, as against about 103,500 cars produced last year.

Current schedules indicate that about 110,000 of the 1954 models will be completed. Shutdown for model changeover will be only about 10 days, assuring Cadillac plenty of time to reach its production goal for the calendar year.

• • •

Without fanfare, Ford has been installing tubeless tires as standard equipment on some of its current models. Ford thus becomes the second auto maker—Packard was first—to equip its cars with the tubeless tires at no extra cost to the customer.

Says a company source: "No special reason for it. We happened to have a stock of the tires and decided to use them."

How complete is "complete"?

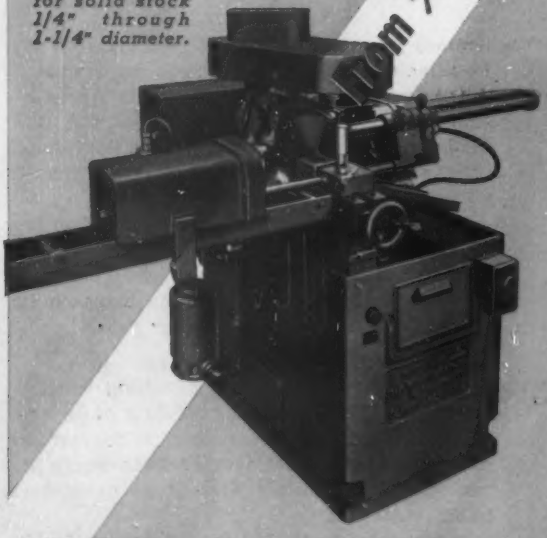
Motch & Merryweather builds circular sawing machines which cut off stock up to 43" diameter, ferrous or non-ferrous (titanium to magnesium) –rounds, squares, or structural shapes.

Model No. 5 High Speed Type, for non-ferrous stock through 43" dia.

Fifty Years 1904 • 1954

...m 1/4" all the way up through 43"

Model No. 00-A for solid stock 1/4" through 1-1/4" diameter.



Using the Triple-Chip method, Motch & Merryweather circular sawing machines cut off stock faster and more economically than does any other method. We offer you not only a complete line of machines, but complete service after the sale. Only Motch & Merryweather builds all three—the Triple-Chip saw blade, the circular sawing machine which uses it, and automatic blade sharpeners to sharpen and re-sharpen at low cost.

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Machine Tools . . .

Machine-tool new orders are back to late spring levels following a slackdown in July, when a drop in new orders to $36.5 million marked a post-Korea low.

New orders jumped some 20 points in August on the NMTBA Index, preliminary reports say.

Machine-tool shipments, however, remained just about the same as the low July Index level of 204.7.

Neither July's low point for new orders, nor July and August's cutback in shipments came as a surprise to the industry—both had been predicted as the year's worst months.

There is good reason for the low mid-summer shipments. In recent years, more and more major machine-tool plants have had two-week vacation shutdowns in July or August. Even a few major plants reporting only 50% production for the month can make the all-industry output figure show a sharp downturn.

• • •

Thirty-year-old Frederick Richmond, ex-importer who heads three machine tool firms already, is empire building at a spectacular rate.

Chairman of Brubaker Tool Corp, Baker Bros Inc, and Gear Grinding Machine Co, he recently acquired Republic Gear Corp of Detroit and its subsidiaries, Detroit Bevel Gear Co and Almetal Universal Joint Co for $2.7 million. They will be operated by Gear Grinding.

He also numbers among his recent purchases Birdsboro Foundry & Machine Co, Birdsboro, Pa.

Now, at press time, Mr Richmond is awaiting stockholder approval of his offer to buy Hydraulic Press Mfg Co, Mt Gilead, Ohio, for an estimated $4.3 million.

If the deal goes through, it is said he will merge H-P-M with Birdsboro.

Contrary to industry rumors, Mr Richmond doesn't head a powerful syndicate of financiers. He is financing his machine-tool empire by issuing debentures that are being acquired by insurance trusts and investor groups. Mr Richmond and his associates, however, retain the companies' common stock.

His goal: to form the world's largest machine-tool building firm—one that could manufacture, sell and finance all the machine tools and equipment needed to equip or re-equip entire metalworking plants. And he would take in old machine tools as partial payment.

• • •

Great Lakes area machine-tool builders have divided opinions as to how much they will benefit from the St Lawrence Seaway—but they're all in accord that it won't hurt business.

Cost of packaging and transfer charges would, of course, be much lower than they are from Atlantic ports, and ocean freight rates from inland ports would be considerably less for shipping machine tools overseas. Everybody's pretty much in agreement on that.

But some 12-14 Great Lakes area machine-tool builders who have plants overseas, or who have licensing arrangements with European builders, say it doesn't mean a thing to them whether the Seaway is built or not.

• • •

In recent weeks, ODM has okayed leasing of idle government-owned machine tools to at least two metalworking firms for civilian output. In both cases, BDSA has objected strongly.

Sixteen tools originally costing $185,000 have been leased to Highway Trailer Co, Edgerton, Wis, the Army Signal Corps' sole supplier of earth-borer and pole-setter trucks. Highway Trailer has a line of 35 Army tools worth $490,000.

Under terms of the lease, the company will pay $50,000 over the next five years to use the 16 tools to manufacture heavy-duty earth-boring equipment for sale to private utilities. In addition, Highway Trailer will maintain the other 19 US tools in place.

The Army pushed the deal through, claiming it would cost $85,000 to move the tools out of Highway Trailer to a government depot.

But BDSA warned that leasing of the tools for civilian work would "dissipate the mobilization base" and provide "an unfair competitive advantage" for Highway Trailer over firms which don't have "cut-rate facilities."

ODM overruled BDSA, however, on grounds that the deal would "preserve" Highway Trailer as a defense supplier.

In the other just-approved lease, Medart Co, St Louis maker of materials-handling equipment, will be allowed to use two large horizontal boring mills on non-defense work for several days each month. In return, Medart will maintain the mills for GSA.

• • •

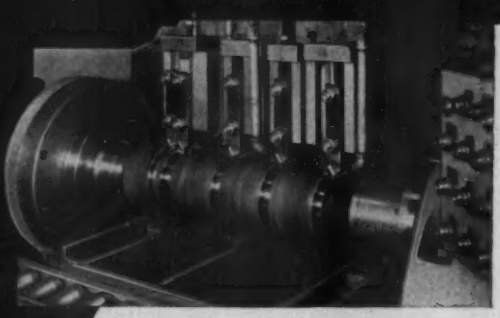
Fast amortization for modernizing of defense installations has definitely been turned down in a decision made by the inter-agency Defense Mobilization Board.

Here's why DMB turned thumbs down on the plan to keep defense production facilities up to date through fast tax writeoff of replacement machinery and equipment:

Reason 1: Output expansion has been the aim of fast amortization from the start—and modernization doesn't fit into the pattern.

Reason 2: Dispersal of defense facilities is still a major goal. Tax benefits for modernization would tend to keep defense installations in critical target areas.

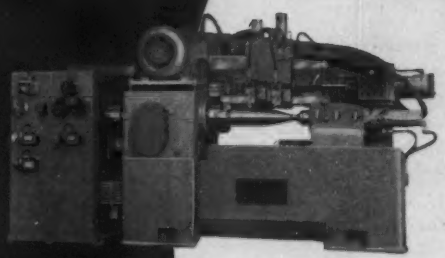
New HYDRA-FEED



52 lbs. of metal being removed per minute on one of the HD-16 Hydra-Feed lathes.

The HD-12

Like all other models, designed to J.I.C. standards. Note absence of tools in front of machine. Swing over top carriage is 14 inches on this model. Length between centers is 36 inches.

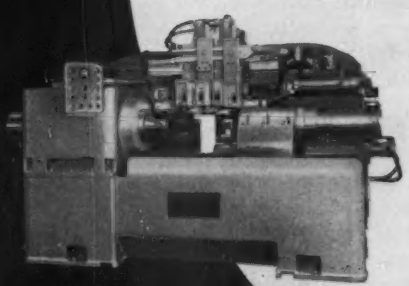


Announcing

the new high production pace setters

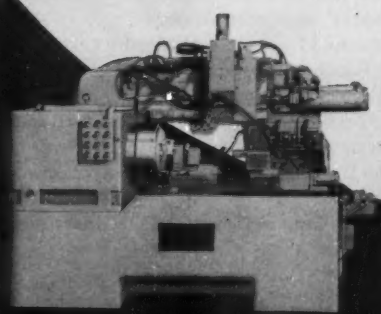
The HD-16

Chip disposal presents no problem on Hydra-Feeds. Big chutes have provision for chip conveyors. This model carries a 100 hp. motor. Length between centers is 48 inches; swing over top carriage is 17-inch diameter.

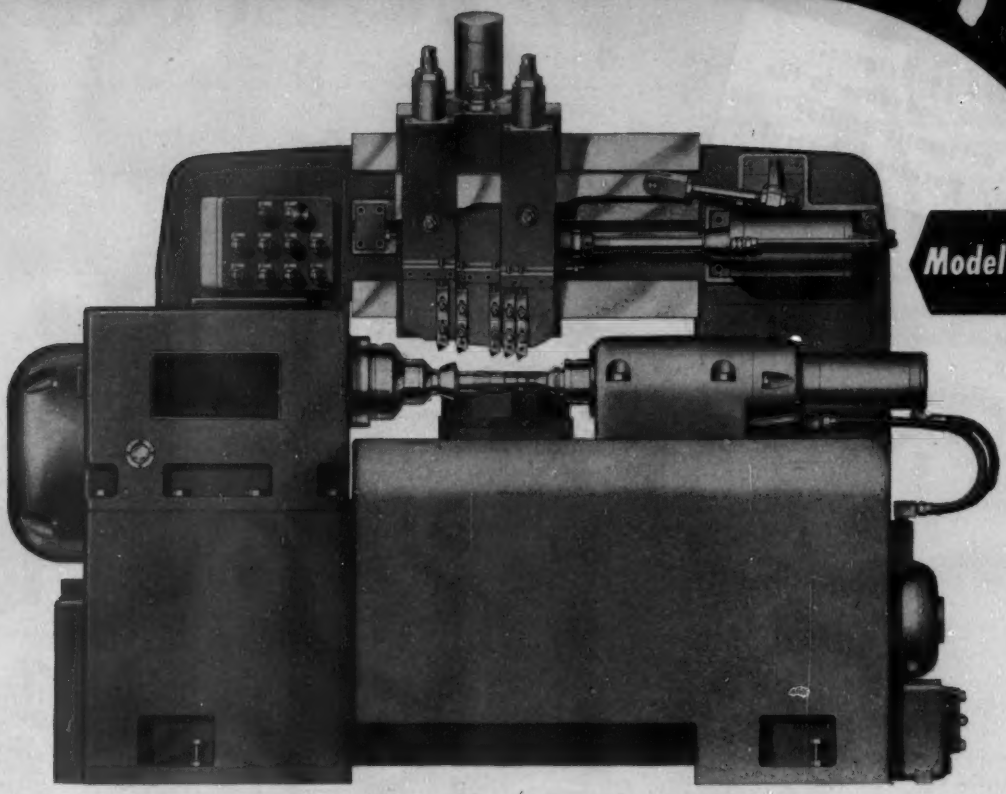


The HD-24

Chucking type model with platen slides (optional). Like all other Hydra-Feeds this machine has infinitely variable speed ranges through pick-off gears; longitudinal feeding rear and top carriages available.



AUTOMATIC LATHES!



Model HD-8

AUTOMATION?—Easy to apply. No obstruction.
CARBIDES?—Maximum carbide performance insured.
OUTPUT?—Maximum rates of metal removal.
CHIPS?—No problem. Automatic removal if desired.
MAINTENANCE?—Simple. J.I.C. throughout.
SMOOTHNESS?—Downward tool pressures plus massive design.

And every new feature of this remarkable new line of lathes has been thoroughly field tested in actual production over several years. *Ask for Catalog*

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Index Pattern may also be changed by Push Button Control.

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THE AVEY DRILLING MACHINE CO. Cincinnati 1, Ohio

Gaging Metalworking . . .

PRODUCTION INDEX
BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	SEPT '54(*)	AUG '54(p)	JULY '54(r)	AUG '53
Tot. Index	**147**	**148**	**148**	**171**
Machinery	**128**	**126**	**145**	
Electrical Machinery	**180**	**173**	**203**	
Autos	**98**	**100**	**125**	
Other Transportation	**285**	**290**	**307**	
Other Metalworking	**126**	**126**	**144**	

(*) Estimated (p) preliminary (r) revised

General all-around pickup in Metalworking, following a summer turndown in some lines, is very much in evidence.

Take the drop forging people, for instance—they're feeling better than they have at any time in the last several months.

That's because they, like many other Metalworking producers, are getting a lift from the release of new orders from the automakers.

Drop forgers' backlogs remain at around three months at current production rates.

That industry is being pressured by customers to shave its prices. They're passing the pressure on to the steelmakers because of the current plentiful supply of steel bar.

At least one small independent bar producer is shading prices, and the amount of the cut is being passed on by the forgers.

Drop forgers are operating about 35% off from last year, but current activity is expected to raise that level at least 5% this month.

• • •

Cutting tool manufacturers are looking forward to a decided business pickup within the next 30 days. Here, too, tooling orders from the automakers will play a big part in hoisting the industry out of a summer slack.

Last quarter pickup predicted by industry officials should bring industry sales to within 15% of last year's. Two other factors bear out optimism for the fourth quarter: (1) distributor stocks are well down, and (2) Pacific Coast planemakers are stepping up orders for several types of cutting tools.

• • •

Steelmakers are looking forward to the fourth quarter as the best of the year. For one thing, heavy steel inventories have just about disappeared in many areas.

And even without summer new orders from the auto industry, August was the best month of the year so far. Orders came in from practically every other steel-using industry.

When substantial automotive tonnage orders come in from Detroit in November and December and are added to the increase started in August, the steelmakers can look forward to about 73%-of-capacity operations through first quarter 1955.

• • •

It's not all beer and skittles for the fourth quarter, however. US bolt and nut makers are dragging along at about 70% capacity. And they see nothing in the future to brighten the sky—at least not at the moment.

Two reasons for the dark clouds: (1) the government is dumping surplus nuts and bolts on the market at auctions all over the country, and (2) foreign manufacturers are cutting US prices right and left.

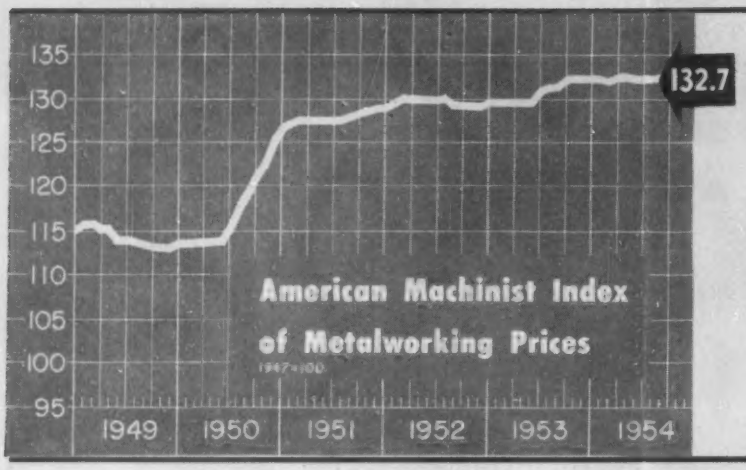
• • •

Plumbing and heating equipment sales are holding up well—mainly because this is one of the all-time-high construction years.

One major producer reports sales to date are just under last year's, and its rate of incoming orders is gaining. The firm expects heavy sales in the fourth quarter, and well into next year.

But there's a fly in the ointment. Price cutting has become a serious problem in the plumbing and heating equipment field.

Gaging Business . . .



PRICE INDEX

	SEPT '54(*)	AUG '54(p)	JULY '54(r)	AUG '53
Total Index	**132.7**	**132.6**	**132.4**	**132.1**
Metalworking Machinery	**141.6**	**141.6**	**140.9**	
Other Machinery exc. Electrical	**137.4**	**137.3**	**136.4**	
Electrical Machinery	**131.0**	**131.0**	**130.7**	
Fabricated Metal Products	**129.9**	**128.7**	**128.8**	

(*) Estimated (p) preliminary (r) revised

New survey of capital expenditures, just released by the Commerce Dept and Securities Exchange Commission, indicates that capital spending in the fourth quarter will be the lowest for the entire year.

The survey estimates fourth quarter expenditures will decline to an annual rate of $26 billion, compared to the first quarter's $27.5 billion rate, and the all-time peak of $28.9 billion reached in third quarter 1953.

• • •

Metalworking activity has held stable through August, staying within one point of 147 on the American Machinist Index of Metalworking Production (see p107) for the sixth consecutive month.

In general, metalworking is currently close to last March's levels. There are two exceptions. Auto production has declined about 18%. Electrical machinery output is up 10%.

Non-durable goods production has held up somewhat better over the last 10 months than durable goods output. But on the whole, industry has stayed very close to last December's output levels.

• • •

Prices, too, have remained fairly steady throughout the year. The wholesale price index, for instance, hasn't varied more than two points in the last year and a half.

Retail prices have stayed in line, too, so that the purchasing power of the dollar is just about what it was on January 1 of this year.

• • •

Construction activity hit another all-time high in August—for the second month in a row.

Annual rate of spending on new construction for the first eight months of 1954, after seasonal adjustment, was about $36.5 billion, compared with $35.3 billion for the same period last year.

The construction industry has been largely responsible for keeping capital expenditures at a high level so far this year.

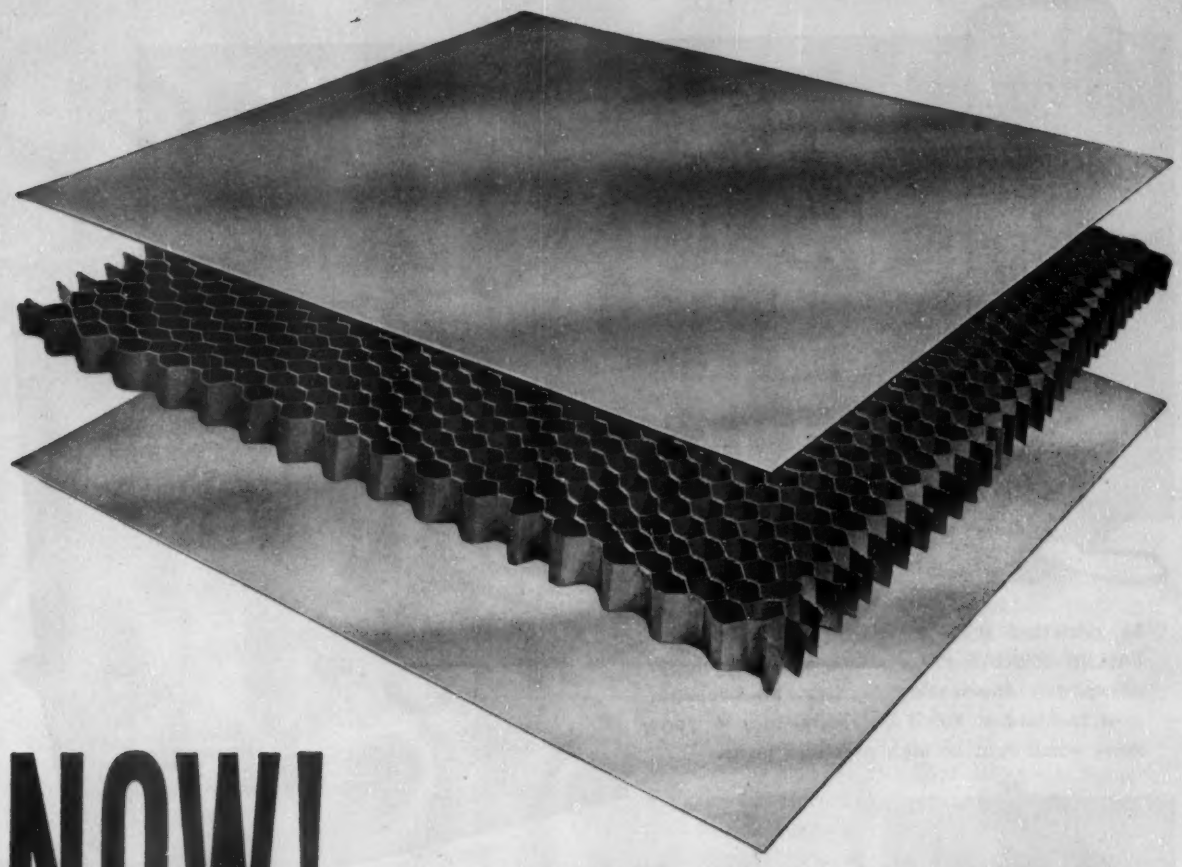
WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-1949 = 100)*	121.9	122.1	130.8
Steel ingot operation (thousands of tons)	1,580	1,502	2,060
Electric power output (million Kilowatt hours)	8,808	9,087	7,963
Production of automobiles and trucks	84,556	110,995	122,863
Engineering construction awards (*Eng. News-Record*—millions)	$306.4	$220.7	$180.8

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Index of industrial production (1947-1949 = 100)*	124	124	136
Index of durable manufactures production (1947-1949 = 100)*	135	134	157
Durable goods manufacturers' sales, millions*	11,456	11,395	13,410
Electrical machinery manufacturers' sales, millions*	1,329	1,316	1,462
Other machinery manufacturers' sales, millions*	1,928	1,901	2,125
Durable goods manufacturers' new orders, millions	9,763	9,985	11,600
Electrical machinery manufacturers' new orders, millions	1,101	905	1,582
General machinery manufacturers' new orders, millions	1,630	1,793	1,752

* Seasonally adjusted



NOW! Cellular Sandwiches of Stainless Steel for Aircraft

This cellular mat of Armco 17-7 PH Stainless strip is the filler that is sandwiched between two stainless steel sheets to make an aircraft panel.

How It Works

The 2 to 3-thousandths of an inch thick core material, when bonded into panels with adhesives or by brazing, permits the skins or faces of the panels to be stressed to their yield strength without premature buckling. The core carries the shear and compressive loading.

Why It's Strong

Panels have very high strength-to-weight ratio due to their design, and because both filler strip and cover sheets are made of Armco 17-7 PH. This precipitation-hardening stainless steel develops typical tensile yield strengths of 180,000 psi, and even higher *compressive yield strengths*, through double low-temperature heat treatment.

Where Used

The cellular 17-7 PH stainless panel is under development for jets, rockets and missiles because of its great strength at temperatures up to 900 F. Yet it can be used in cold or hot service for tail pipe shrouding, leading edge sections, bulkheads, fins, control surfaces, after-burner cases, and many other applications requiring corrosion resistance, lightness and enduring strength.

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Just write us at the address below and we will send you complete information on the precipitation-hardening stainless steels, Armco 17-7 PH and Armco 17-4 PH.

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WHEN PRECISION DEMANDS AIR GAGING

Be protected with a SHEFFIELD ADJUSTABLE BALLJET SPINDLE KIT against an accident, an unexpected engineering revision, an oversight in a tool order. You'll be ready, too, to gage those small runs of high precision parts.

Size Setting Gage

In 5 minutes you can assemble from the Kit a spindle for any size within a range of one to three inches and set it to size with the Size Setting Gage. Four spindles of various sizes can be placed in use simultaneously.

NO MASTER SETTING RINGS NEEDED

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To assemble and use these spindles, you need only an air gage and the equipment illustrated in the Kit plus a set of standard gage blocks—nothing else—not even one master setting ring. The air gage is calibrated by using the standard calibrator illustrated.

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6749

MASTER CRAFTSMAN SHEFFIELD HEADQUARTERS

SHEFFIELD

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

What Are You Doing About Depreciation?

For the first time in 20 years, our tax depreciation policy on new production equipment approaches realism.

How familiar are you with it? Are you prepared to get out of it all the advantages that Congress has written into it?

You no longer have to take 15 to 20 years to recover most of the capital invested in a new machine. You no longer are bound by the rule that you must stick to straight-line deductions through thick and thin.

You are free to choose any of several depreciation methods. One is the declining-balance method. It allows you to write off about two-thirds of the original cost of a machine in the first half of its tax life.

Another is the sum-of-the-digits method, which permits you to depreciate three-fourths of the cost in the first half of the tax life.

The best part about both of these methods is that they are based upon recognition of the principle that a machine depreciates faster in the earlier years of its useful life than in the later years. Since 1934, the Treasury Department has consistently refused to recognize that fact.

The new law permits a shift in any year from the declining balance to straight-line depreciation. It thus becomes possible under certain conditions for a taxpayer to take the large write-offs in the early years and relatively small write-offs later on, if he so chooses.

Bulletin F, of dubious fame, is still with us as the guide for determining a machine's useful life span. But don't let that throw you. There are hundreds of cases in recent years in which either the court or the Internal Revenue Service has sanctioned the use of shorter lives. What's more, the rules under which the Internal Revenue Service operates now take into account the obsolescence factor in setting up fair rates of depreciation.

Don't overlook one tremendous advantage which the new law puts into your hands. It used to be that the burden of proof was upon you if you wanted to vary one iota from the rigidity of the straight-line method, with Bulletin F as the starting point. As a result of provisions in the new law and the change in attitude by the Internal Revenue Service, the burden of proof has been transferred in large part to the Revenue people.

These changes in your favor, while not as sweeping as they should be, are of major importance. They were not made the law of the land for fun. They are intended to make it more profitable for you to invest in new plant and equipment by getting your capital back in a shorter time than heretofore. President Eisenhower went on record publicly on this point.

From here on, it is up to you. The law is there for you to make use of its provisions. You no longer can hide behind the excuse that you are retaining old machines because the government's tax write-off policy is against you.

It is the right time to examine carefully all the profit to be derived from Washington's about-face on depreciation. It likewise is the right time to examine carefully all the old equipment in your plant to see what can be replaced, with marked cost-reduction and tax advantages.

Burnham Finney

50 lbs. oil pressure

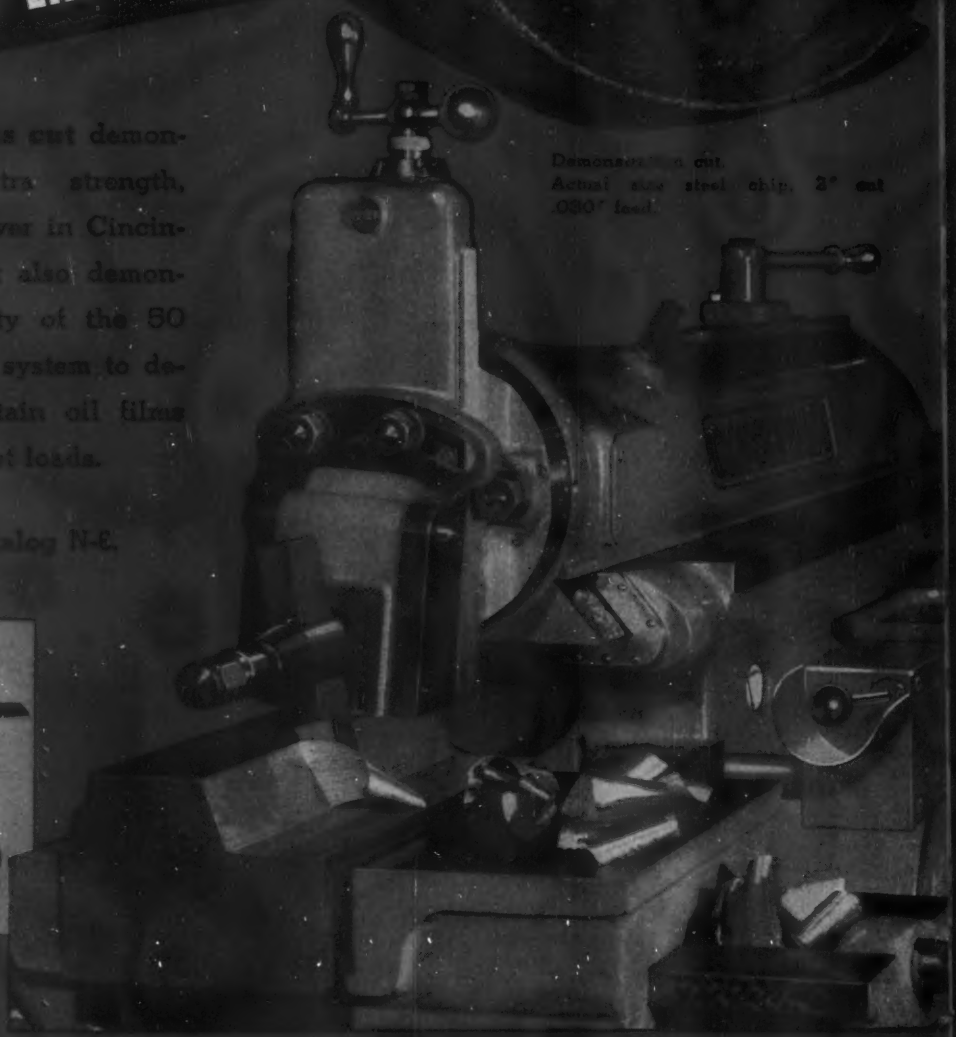
IS NECESSARY WITH A CUT LIKE THIS...

Demonstrates a cut.
Actual size steel chip. 2" cut .030" feed.

This tremendous cut demonstrates the extra strength, rigidity, and power in Cincinnati Shapers. It also demonstrates the ability of the 50 p.s.i. lubrication system to develop and maintain oil films under the heaviest loads.

Write for Catalog N-8.

50 p.s.i. system includes 10 micron filter, cutting lubricant reservoir. Transmission case submerged in oil.



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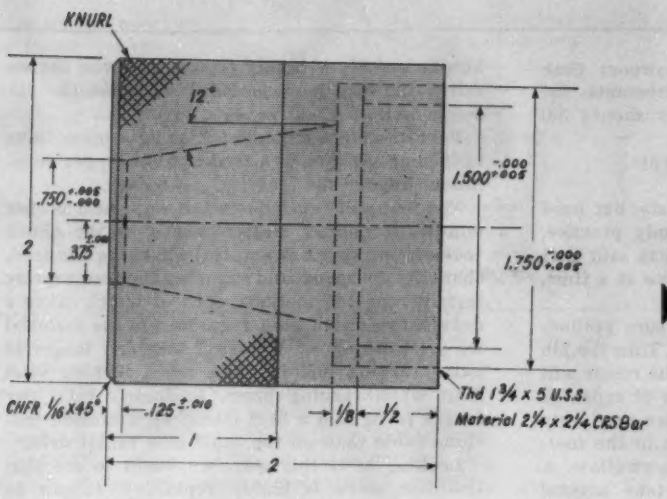


how long should it take to make this part?

Standard minutes...

they work in the toolroom, too!

Today, the idea of toolroom time standards often engenders the remarks of 50 years ago about the first airplane—"looks fine on paper but it'll never get off the ground." Yet measured toolroom time standards and incentives have been successfully used for the past ten years

RICHARD M CROSSAN, vice president, SERGE A BIRN CO, INC, LOUISVILLE 2

There are three main kinds of toolroom standards:

1. The educated guess;
2. "It's about like the one we made last year"; and,
3. A standard consistent to ± 5% over any range of sizes, shapes, and materials.

This latter standard has the same relationship to the educated guess as the airplane had to the free balloon. The same thing can be said for toolroom standards not based on actual measurement. (Incidentally, when I speak of measurement of toolroom work, I'm talking about measuring everything, including setups).

With toolroom standards as accurate and consistent as the standards we can set on production work, a lot of problems disappear.

For one thing, estimates are taken out of the "pass, punt, and pray" category, or "add 25% to be on the safe side."

Planning is practical and realistic. Machine loadings, and even delivery dates, are forecast with confidence.

Costs are compared exactly. If there is a choice between, say, doing a job on the milling machine instead of on the shaper, we can base our choice on cost *facts* instead of on a good strong hunch.

Finally, the way is wide open to putting toolmaking—at least a good big piece of it—on incentives. This is a most important consideration. Any application of standards that offers a saving of 20 to 25% in labor costs certainly deserves exhaustive study.

"People say it can't be done because . . ."

Let's admit there are reasons why toolroom standards can't be established. (About the only one I don't remember hearing, since the first toolroom-incentive job we installed, ten years ago, is that "if God had wanted us to have toolroom incentives, he would have given them to us.")

First, they can't be done because no toolmaking jobs are ever alike. If you study one job today you have nothing but history when another job comes along tomorrow. That's like knowing it rained yesterday when you are planning tomorrow's picnic.

Second, no two toolmakers work exactly alike. Being highly skilled craftsmen, each has his own

To be worth doing . . . toolroom time standards should meet the requirements for standards on production work. They should be:

1. Consistent, within ±5%.

2. Economical to determine and apply.

3. Easy to understand.

These requirements are easy to state, but hard to meet. With conventional time-study practice, they are impossible. But someone has said that even an elephant can be eaten—a bite at a time. That's the approach we take here.

Conventional time study will measure production jobs because they are repetitive. Time the job with a stopwatch, set the rate, and the result will apply to hundreds or even millions of repeated cycles. This is a small elephant, so we need only one bite. But if you tried to do this in the toolroom, the bites would be too big to swallow. A complicated fixture or die might take several hundred man-hours of work, so it would take several hundred man-hours of time-study observation. Chances are, too, that only one of these fixtures would be made, so we'd have a fine record of what the toolmakers did, but it wouldn't help when setting the rate for the next job.

So we don't study how long it takes to make *things* in the toolroom. Instead, we study how long it takes to perform *elements of work*.

We can all agree that assembling telephone jacks is highly repetitive. Generally we would agree that building milling machine fixtures is non-repetitive.

As a matter of fact, toolroom work is a highly repetitive kind of activity. In fact, every type of human activity is highly repetitive—even the so-called indirect jobs, *provided we make the elements of work small enough.*

Take a simple example: "Set an engine lathe to turn at 250 rpm, at a feed of 0.004 in. per revolution. Engage the feed."

The tool will move down the ways at 1 in. per minute. It doesn't matter what's in the chuck (even if the chuck is empty). Changing the feed, changing the speed, and engaging the feed require certain repeated motions, each of which takes a definite amount of time, regardless of the material we are working on. It doesn't take any longer to put a turning tool in place when turning steel than when turning brass. It doesn't take any longer to tighten a heel clamp on a milling machine table than on the table of a radial drill.

Looking at it this way, we begin to see that toolroom work is highly repetitive. It can be studied as a series of small elements which always—under carefully defined conditions—take the same standard performance time.

The problem then becomes one of finding certain easily handled element times which will completely cover the range of work under study. Then we have to develop a method of combining these element times to describe the completed activity needed to finish the job.

As we will see later, what we do is make a series of tables of standard elements for each machine. We then pick out, from these tables, the elements needed; determine the frequency at which the element occurs; and add the resulting numbers to give the job-time required.

way of doing things. Therefore, a standard for one man on a job would not apply to another man on the same job. This line of thinking hints that there are more prima donnas in the world's toolrooms than in the world's opera houses. With production work you're not supposed to have this problem. Production jobs, so the reasoning goes, have a set motion-pattern.

Any methods engineer accustomed to studying production work will tell you that even on highly repetitive work, motion-patterns (and therefore time) can and will vary between operators as much as 50%. Variation in method is actually much more critical in setting production job rates than in the toolroom.

The third objection is that you can't measure "thinking time." Toolmakers have to plan the job, read prints, calculate angles, and so on and on and on. And how are you going to time how long it takes a man to think? It isn't easy, but it can be done. (More about this later.)

The first step we take is to develop a list of what we call Standard Elements. This is simply a list of the various repetitive operations which the operator uses to run his machine. Depending on the machine and the range of work covered, there may be as many as 50 to 250 elements for each machine.

Familiarity with the class of work to be studied is very helpful here. However, anyone with shop experience can learn this technique quickly, even for unfamiliar types of work.

Now we start "eating the elephant." We find times for performing these repetitive elements under various conditions. There will be two kinds of elements—"constants," which always require the same time; and "variables," which have different times under different conditions. The proportionate number of each will depend on the way we do our measuring.

Probably the best known way of obtaining element times is with time study, with which we would observe a wide range of jobs, timing the job as a series of elements, rather than as a job in itself. In other words, we forget the thing in the machine. As we make studies, we list the results on a master table, so we can compare different observations and select time for constants, and find out how and why variables vary.

In time, we will have completed a list of what we call Standard Data for the machine (or kind of activity) which we have been studying. Each list will contain the time needed for every job-element on a particular machine.

How long will it take?

If done with time study, Standard Data for a toolroom engine lathe, for example, can be developed in about six weeks. Multiply six weeks by the number of basic machine tools and basically different activities in the toolroom, and the measurement problem looks like an 80 to 120 man-week job.

Fortunately there is a lot better answer than time study. We couldn't think seriously of standards for any

Drillpress standard elements

A..Get job and instructions
B..Make out time card
C..Walk to and from tool crib
D..Pick up tools
E..Lay aside tools
F..Wait for service at tool crib
G..Place cutting tool in chuck
H..Remove cutting tool from chuck
J..Set vise on machine table
K..Remove vise from machine table
L..Adjust vise opening
M..Set wood block in vise
N..Remove vise from machine table
P..Wipe off machine table
Q..Raise machine table
R..Lower machine table
S..Swing machine table
T..Rotate machine table
U..Set speed
V..Set feed
W. Set depth collar
X..Study drawing
Y..Inspect first piece
Z..Drill
A1..Start or stop machine
B1..Place piece in vise
C1..Remove piece in vise
D1..Tighten or loosen vise
E1..Apply coolant
F1..Lower spindle
G1..Raise spindle
H1..Engage power feed
J1..Disengage power feed
K1..Position piece under drill
L1..Lower spindle for additional hole
M1..Raise spindle for additional hole
N1..Position piece for additional hole

non-repetitive work if there weren't. By using *predetermined motion times*, instead of time study, a man experienced in this approach can reduce the 80 to 120 man-weeks cost to something like 30 to 50 man-weeks, to obtain Standard Element times. Here the system known as MTM is best, as far as I'm concerned, although any of the recognized predetermined-time systems will get good results.

Here's how we go about it:

Let's go look at our simple example for the engine lathe. We have three elements to consider:

1. Change feed.
2. Change speed.
3. Engage feed.

What does the operator do when he performs the element "change feed," for example? In detail, he:

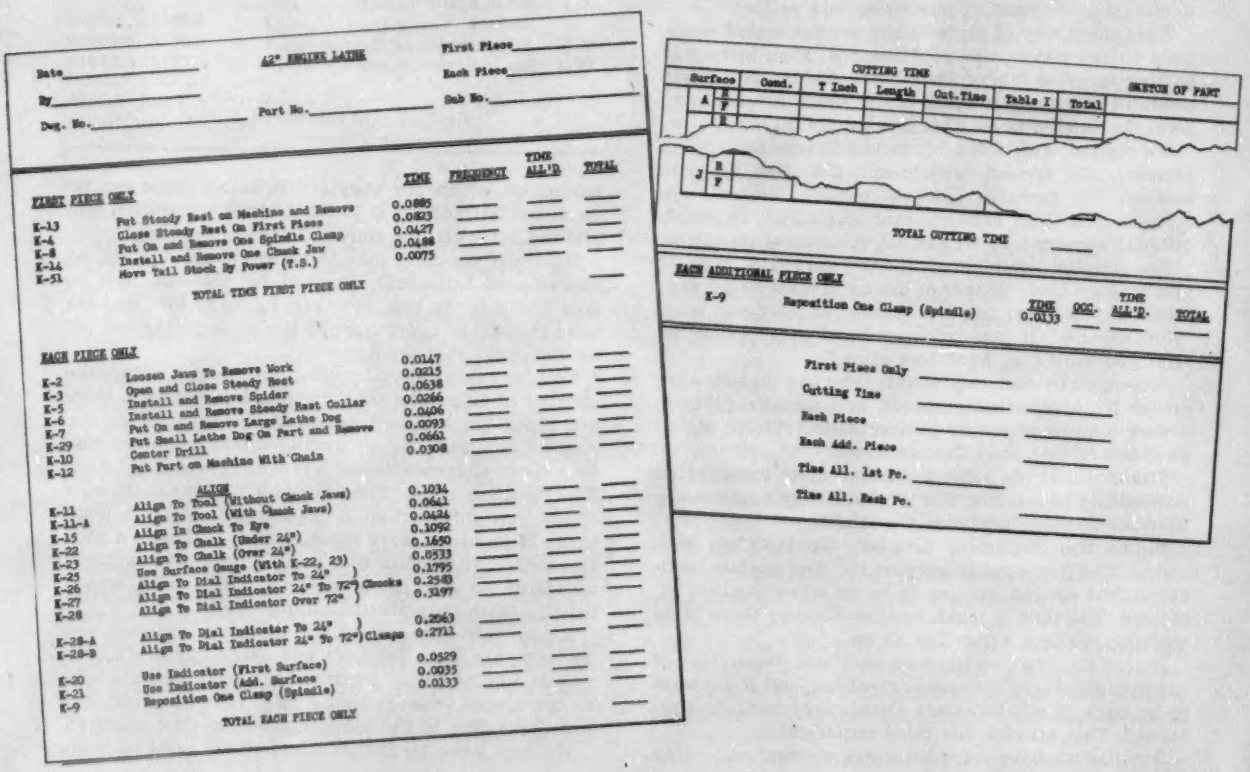
1. Reaches to the cross-slide feed knob.
2. Grasps the knob.
3. Turns it to engage the lead screw.
4. Applies pressure to assure engagement.
5. Lets go.

Without going into a detailed discussion of MTM, an analysis of this element would look like this:

LH Description	Symbol	Time	Symbol	RH Description
		11.4	R16A	Reach to feed knob on saddle
		1.7	G1a	Grasp knob
		4.1	T60S	Turn to engage the lead screw
IDLE		16.2	AP1	Engage
		1.7	RL1	Release knob
		35.1		Time measurement units

Simply adding the times for the various motions (from the MTM Standard Data Card) gives us a time for engaging feeds (under all conditions) of 0.0035 hours or 0.021 minutes.

A ratesetter who is familiar with lathe work and thoroughly familiar with MTM, can develop the Standard Data for a lathe in one to two weeks, depending on the range of work to be covered. I have developed complete standards for chucking and trueing up, including non-concentric work, to dial indicator tolerances, in less than two days. I have also done the same


42" ENGINE LATHE
Date
By
Dwg. No.
Part No.
First Piece
Each Piece
Sub No.
TIME
FREQUENCY
TIME ALL'D.
TOTAL
FIRST PIECE ONLY
K-13 Put Steady Rest on Machine and Remove 0.0865
K-4 Close Steady Rest On First Piece 0.0823
K-8 Put On and Remove One Spindle Clamp 0.0427
K-14 Install and Remove One Chuck Jaw 0.0488
K-51 Move Tail Stock By Power (T.S.) 0.0075
TOTAL TIME FIRST PIECE ONLY
EACH PIECE ONLY
K-2 Loosen Jaws To Remove Work 0.0147
K-3 Open and Close Steady Rest 0.0215
K-5 Install and Remove Spider 0.0638
K-6 Install and Remove Steady Rest Collar 0.0266
K-7 Put On and Remove Large Lathe Dog 0.0406
K-29 Put Small Lathe Dog On Part and Remove 0.0093
K-10 Center Drill 0.0661
K-12 Put Part on Machine With Chain 0.0308
ALIGN
K-11 Align To Tool (Without Chuck Jaws) 0.1034
K-11-A Align To Tool (With Chuck Jaws) 0.0641
K-15 Align In Chuck To Eye 0.0434
K-22 Align To Chalk (Under 24") 0.1092
K-23 Align To Chalk (Over 24") 0.1650
K-25 Use Surface Gauge (With K-22, 23) 0.0533
K-26 Align To Dial Indicator To 24" 0.1795
K-27 Align To Dial Indicator 24° To 72° Chucks 0.2540
K-28 Align To Dial Indicator Over 72" 0.3197
K-28-A Align To Dial Indicator To 24" 0.2063
K-28-B Align To Dial Indicator 24° To 72" Clamps 0.2711
K-20 Use Indicator (First Surface) 0.0529
K-21 Use Indicator (Add. Surface 0.0035
K-9 Reposition One Clamp (Spindle) 0.0133
TOTAL EACH PIECE ONLY
CUTTING TIME
Surface
Cond.
T Inch
Length
Cut. Time
Table I
Total
SKETCH OF PART
A
J
R
F
TOTAL CUTTING TIME
EACH ADDITIONAL PIECE ONLY
K-9 Repetition One Clamp (Spindle) TIME 0.0133 OCC. TIME ALL'D. TOTAL
First Piece Only
Cutting Time
Each Piece
Each Add. Piece
Time All. 1st Pc.
Time All. Each Pc.

job with time study in something over two weeks of observing and calculating.

The difference comes from the proportionate number of constants and variables in the Standard Data. Variables take lots of time to measure, and with time study you will have a lot of them. With MTM you will have *none at all!* Any kind of work can be broken down to elements so fine that they are always constant. The reason you cannot measure them economically with time study, is that time study has a built-in human limitation. There is a limit to how fast you can observe operator and stop watch, and put figures on paper.

For example, all trueing up in an engine lathe is done with combinations of about 30 small elements.

If you use time study, you must study many different entire setups—long work, short work, small and large OD, concentric and eccentric, square and round, true to eye, true to ± 0.001-in. dial reading, and so on. Of course, you can study the 75% that are common and make a guess at the rest. But remember the ± 5% limitation we've imposed.

Where do we go from here? We have seen how to break a given class of work down into constant elements small enough to handle, and we have seen one way to handle them. Unfortunately, in the process we have made it impossible to fulfill the second requirement set for our standards. In breaking the elements down into constants small enough to measure, we make them too small to apply economically.

Therefore, we have to find some way to put our small elements together so they can be applied in groups from a sketch or blueprint to give us the job time.

At this point we are in the position of a man who wants to build a house. We have lumber (standard elements) and we have alternatives. The housebuilder can go about his job in several ways. He can buy rough lumber and spend a lot of time finishing the house. A somewhat quicker way is to buy lumber already cut to size, thus eliminating measuring and cutting.

The fastest way of all is to buy pre-fabricated walls, floor, ceiling panels, and roof sections. Then instead of putting together lots of little parts, the builder would assemble relatively few big parts, which are made up from the smaller ones. This is what we do now.

We started with a list of standard elements (rough lumber). We applied predetermined motion times to measure the elements (pre-cut pieces). Now we are going to put them together into application constants (pre-fab sections), so we can set economical standards.

The simplest combination is the "start-stop" type. If you "engage feed," sooner or later you must "disengage feed"; if you "start spindle," sooner or later you must "stop spindle." If you "pick up hand tool" sooner or later you must "lay hand tool aside."

Consequently elements of this type can be added together for application purposes, and we already have a very simple degree of prefabrication. We've got to go much farther than this, however.

The tables at the right give some more complicated possibilities to see how this works. (They apply every time the operator performs the job.)

Notice the distinction between the last two constants. The first applies only to the first surface indicated. The second applies to every other surface indicated. The time is much smaller because there is no walking, waiting, setup and so on.

Notice also that we have an excellent description of the method. Every element is recorded, and if we want to go back to our Standard Data, every motion is recorded. This satisfies our third requirement.

Because we have recorded every element and every motion on which our standard is based, there can be no misunderstanding as to what work is required and allowed for when the standard goes to the shop.

Naturally we don't take these sheets out and tell an experienced toolmaker, element by element, how to do a tool job. We can, however, prove to him that we have thought of everything he has to do on the job (or he can prove that we haven't).

This "pre-fabrication" process will greatly reduce the number of figures we must handle. For example, there are about 150 standard handling elements for an engine lathe. These can be simplified and combined into only about 40 constants and a few direct-reading tables. This result we call a "Time Formula." To make it easier to use, the information is usually set up on a work sheet. With such a work sheet, a rate setter with a good knowledge of machine-tool practice can set consistent standards on any job a machine will handle, and it usually takes only about 15 minutes.

If you want to sacrifice some short-run accuracy, you can compare 80 to 100 jobs, and carry this prefabrication to a point where no more than ten constants need be considered when setting a rate. This, however, will add about 50% to the total engineering time required.

We now have all the information we need to begin

INSTALL AND REMOVE STEADY-REST COLLAR

On 40-in. Engine Lathe

Symbol	DESCRIPTION OF ELEMENT	Occurrence	Time	Total
Z	Pick up or lay aside article from tool rack or bench	6	0.0005	0.0030
H-1	Walk from work bench to tool rack	4	0.0013	0.0052
R-1	Walk from tool rack to carriage	2	0.0009	0.0018
Q-1	Walk from carriage to bench	2	0.0009	0.0018
U-1	Install steady-rest collar	1	0.0087	0.0087
V-1	Remove steady-rest collar	1	0.0070	0.0070
			Total:	0.0266 Hours

SET UP DIAL INDICATOR (First Surface)

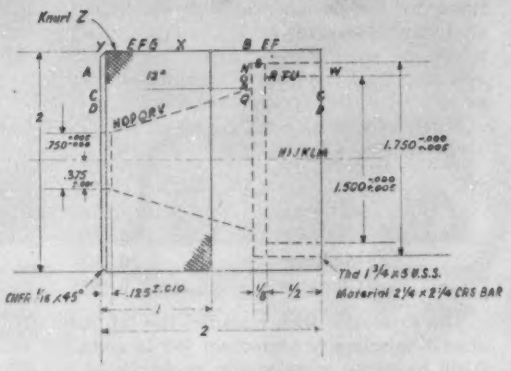
On Universal Milling Machine

Symbol	DESCRIPTION OF ELEMENT	Occurrence	Time	Total
I-2	Wait at tool room window	2	0.0080	0.0160
K	Walk to tool room and return	2	0.0150	0.0300
S-1	Get indicator from box and set up	1	0.0023	0.0023
W-1	Set indicator to work	1	0.0012	0.0012
Y-1	Adjust angle of indicator	1	0.0014	0.0014
T-1	Take indicator from work	1	0.0020	0.0020
			Total:	0.0529 Hours

SET UP DIAL INDICATOR (Additional Surface)

Symbol	DESCRIPTION OF ELEMENT	Occurrence	Time	Total
X-1	Set indicator to next Surface	1	0.0009	0.0009
Y-1	Adjust angle of indicator	1	0.0014	0.0014
W-1	Set indicator to work	1	0.0012	0.0012
			Total:	0.0035 Hours

here's how long it should take:



EXAMPLE OF BREAKDOWN:

A..PLACE PART IN CHUCK AND REMOVE

U-3	Pick up part and move to machine by hand				
		18.6	TBC1	Turn from machine	
		75.0	W5P	Walk to part on floor	
		29.0	S	Stoop toward part	
			R20B	Reach to part (in same motion as "S")	
	G1a	1.7	G1a	Grasp part	
	M12B	13.4	M12B	Move part to carry	
		31.9	AS	Arise	
		18.6	TBC1	Turn toward machine	
		75.0	W5P	Walk to machine	
	M20C	22.1	M20C	Part to chuck	
	P1SD	11.2	P1SD	Part into chuck	
Release	R11	1.7			
	TOTAL TIME	298.5	TMU or 0.0030 hrs.		0.0030
Z-3	Tighten 4-jaw independent chuck				0.0028
X-3	Loosen 4-jaw independent chuck				0.0021
W-3	Remove part from chuck				0.0024
				TOTAL:	0.0113 hrs

• **Here are the pre-fab sections:**

SURFACE	DESCRIPTION	TIME x FREQUENCY	MANUAL TIME	CUTTING TIME
A..	Place part in chuck and remove		0.0113	
B..	Align work to tool		0.0379	
C..	Rough face (first cut)	0.0119 x 2	0.0238	0.0046
D..	Finish face (first cut)	0.0094 x 2	0.0188	0.0176
E..	Rough turn (first cut)	0.0163 x	0.0326	0.0063
F..	Finish turn (first cut)	0.0284 x 2	0.0568	0.0253
G..	Finish turn (each additional cut)		0.0142	
H..	Use tail stock		0.0189	
I..	Center drill		0.0264	0.0019
J..	Use drill to ½ diam.		0.0385	0.0145
K..	Use drill to 49/64 diam.		0.0667	0.0264
L..	Use reamer to 49/64 diam.		0.0667	0.0028
M..	Drill per hole		0.0063	
N..	Use boring bar in round turret	0.0437 x 2	0.0874	
O..	Rough bore (first cut)	0.0086 x 2	0.0172	0.0228
P..	Rough bore (each additional cut)	0.0807 x 4	0.0304	
Q..	Finish bore (first cut)	0.0407 x 2	0.0814	0.0176
R..	Finish bore (each additional cut)	0.0212 x 2	0.0636	
S..	Turn relief		0.0077	0.0056
T..	Use threading tool		0.0474	
U..	Thread (per cut)	0.0032 x 6	0.0192	0.0300
V..	Change compound angle	0.0077 x 2	0.0154	
W..	Turn and rechuck		0.0028	
X..	Align to dial indicator		0.0720	
Y..	Chamfer		0.0130	0.0010
Z..	Knurl		0.0175	
A_1.	Get first tool from tool crib		0.0281	
B_1.	Get additional tool from tool crib	0.0160 x 4	0.0640	
	TIME ALLOWED		0.9762	0.1764

setting rates on the manual operations required for a typical toolroom machine job. We have seen how to:

1. Develop standard data;
2. Combine this data for ease of application; and
3. Develop a work sheet to speed the application.

Now let's do a job and see how it works.

The part shown here was designed merely as a representative engine lathe job. It's neither the easiest nor the hardest thing you can make on a lathe. Because we always follow the rule, "Forget the thing being made," it doesn't make any difference.

Also shown here is the data for the typical engine-lathe job. Remember, this is data for manual operations only. Cutting time calculations are purely mechanical, and can be found in a number of handbooks.

The first thing the ratesetter would do is send the drawing back to engineering, and ask why they didn't specify 2-in. bar stock, because the OD is knurled anyway. This would save all the turning on the OD. Tool designers insist on 2¼-in. stock. So the ratesetter goes ahead with what he has.

He first jots down an average, but sensible, method of doing the job, like this:

1. Chuck at 0.750-in. end.
2. Face.
3. Turn OD up to chuck.
4. Drill and ream.
5. Counterbore.
6. Relieve.
7. Thread.
8. Turn end for end.
9. Rough and finish OD.
10. Face.
11. Chamfer.
12. Turn taper.
13. Knurl.

Now, let's clear up the confusion caused by the fact that no two toolmakers work alike. You'll see that it really doesn't make any difference.

For example, we have numbered our operations from 1 through 13 as they could be done. You could also do them in this way:

1) 1, 3, 2, 4, 5, 6, 7, 8, 10, 12, 9, 11, and 13; or
2.) 1, 2, 3, 4, 5, 6, 7, 8, 10, 9, 12, 13, and 11.

There are probably a dozen good ways to do this job, but that doesn't really make any difference to us. The steps have to be done sooner or later, and the difference in time between sequence 1 and sequence 2 is insignificant.

Of course, if you want to be ridiculous for the sake of

making a point, you can say, "What about this sequence: 1, 2, 3, 8, 9, 10, 11, 8, 4, 5, 6, 7, 8, 12, 13?"

The only answer to this is that anybody doing the job that way isn't a toolmaker.

So, back to the ratesetter. His next step is to take the work sheet and to process the job according to the general method he has outlined. The list of constants here is the result of such processing.

Each major constant (a pre-fabricated section, to follow our analogy) has been identified alphabetically in this example. In practice, each would have a code letter such as K-1, K-2, K-3A, K-3B, which are arbitrary symbols which come from lists of standard times.

The first constant "Place part in chuck and remove" includes these elements:

U-3, pick up part and move to machine by hand.

Z-3, tighten four-jaw independent chuck.

X-3, loosen four-jaw independent chuck.

W-3, remove part from chuck.

They, in turn, are made up of smaller elements, as we have shown only for U-3.

In the shop where this work is being done, the practice is to put material on the floor behind the operator. Therefore, we allow turning from the machine, walking to and from the material location, and so on.

Here's an important point. The motion pattern shown for U-3 would not be used to obtain a part as small as the one we are working with. However, to simplify his work, the MTM analyst has classified as "small" parts, any part that can be easily carried by hand to the machine. (The difference between the allowed pattern and the one the operator would actually use to get this part is about 4% for the element, or 0.015% for the job.)

Here's another point. You might ask, "Why not bring the parts closer to the operator and save all the walking?" Suppose we do it. We have saved about 0.0020 hours per job, or, in this case, (ignoring machine time) about 0.2%. It isn't worth the trouble.

The rest of the analysis is straight-forward enough. In practice, the ratesetter does exactly what we have done here. He does not list the constants each time they are performed. Instead, he lists them the first time, and multiplies by the total number of times they are needed for the job. Remember, we don't particularly care how the operator does the job, as long as he "does it like a toolmaker."

Constant S, "Finish turn first cut," is a good example of this. Here, the constant is allowed once each for the threaded and chamfered ends of the part (because we have a fractional tolerance on the OD). But an additional finish cut, Surface G, is allowed for the chamfered end of the part because we are blending two finished surfaces. The fact that the chamfered end is knurled makes such close finishing unnecessary, but most toolmakers would do it this way, so we allow it.

Finally, there is another very important thing to watch in determining machine times. That is *"frequency."* Note in our example that the ratesetter allows six threading cuts. Now this could just as easily have been ten or 15, depending on machine condition. These formulas have to be tailored to machine conditions. One lathe may be able to finish to ±0.001 in. with two finish cuts where another will take 4 or 6. This information is determined and recorded when the formula is made, however, so the ratesetter need not guess at it each time he sets a rate.

We still haven't said anything about the problem of allowing for planning, thinking, calculating, and so on. Standard Data for the manual elements supplies us with the answer. What we do is make several overall time studies of simple, medium, and complex jobs.

Then, using our Standard Data, we compute the standard time for the manual elements. The difference between time-study time and allowed time is the time spent by the operator in planning. (In taking time-study time, we must level the operator's performance, so we are subtracting "apples from apples.") The result may vary from nothing on simple jobs to as much as 10% on really complicated work.

What we end up with might be something like this (taken from an actual example):

PLAN

Type of job	*Time allowed, hr*
Simple	0.0200
Medium	0.0400
Complex	0.0800

The ratesetter then classifies the job mentally. If he should misclassify a medium job as complex, he is off 0.040 hours on what would probably be a 1.000 hour job, or about 4%. We always tell ratesetters to use the higher value when there is any doubt.

Another kind of activity we haven't discussed is bench work. This is the most difficult kind of toolroom work to study. What we have to do is consider it as a series of activities. We break it down into several distinct kinds of work, such as:

1. Filing and scraping.
2. Aligning and fitting.
3. Layout.
4. Gaging.
5. Part handling.
6. Connecting threaded parts.
7. Hand tapping and reaming.

Because MTM will tell us the time required for each motion the operators make in doing the parts of these activities, we can build our "pre-fab" units for the activities. The problem then becomes one of determining the frequency needed for completion of the job. In some kinds of benchwork this is extremely difficult—occasionally impossible. In others, it is not.

How much will it cost?

A good rule-of-thumb for determining cost of a toolroom installation (provided you know the work and are *thoroughly* familiar with one of the predetermined motion time systems) is:

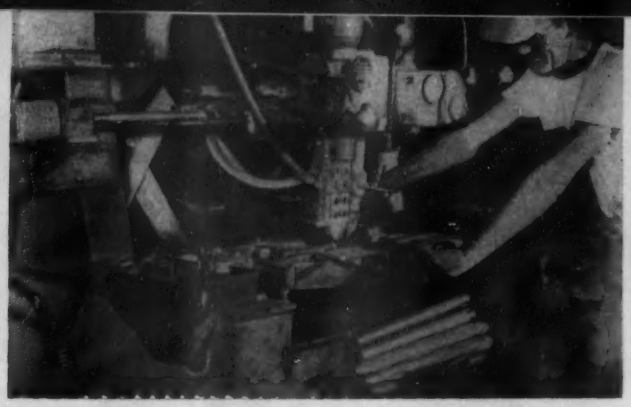
Three man-weeks for each basic kind of machine tool, and one man-week for each distinct bench-work activity. (A number of engine lathes would be classified as one basic machine tool.) Actual time may run somewhat more or less than this, depending on what kind of work you are doing.

And what do you get out of it?

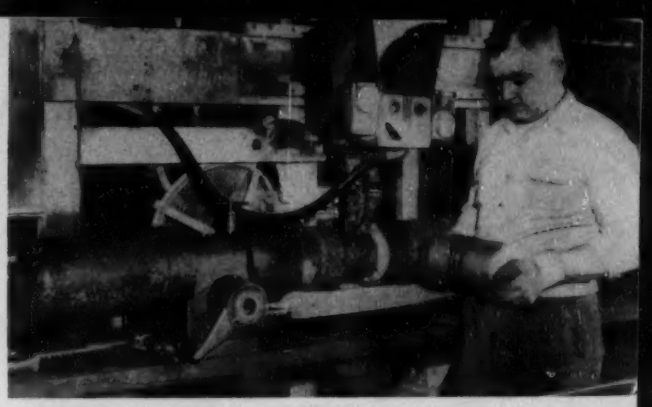
Conservatively, we can expect a reduction in total labor cost of 20 to 25%. This reduction comes from better methods. By offering an incentive, we can expect operators to plan their work better. We can expect them to utilize machine time to prepare for the next operation. We can expect them to make two cuts where they have been making three or four. But most of all, we can expect them to *stay on the job.*

The average person (including me) does not produce at his best level without a goal toward which to work. And if we don't know how long a job should take, we take as much time as we think we ought to.

There is no need to limit application of incentives to the toolroom. The principles we have discussed here can be applied to every kind of indirect labor—from maintenance to storerooms; from pattern-making to repair and salvage. It only takes imagination, experience, and the courage to "try it and see."



PAIR OF TUBES is clamped in fixture for automatic submerged-arc welding of longitudinal seam at a speed of 60 ipm. Assembly is turned over and operation repeated on opposite side. Complete cycle takes about 1 min



GIRTH WELD is produced on automatic hidden-arc machine to join two halves of an absorber pot. Parts are gripped in chucks which press them together and rotate under welding head. Production time is 87 to 100 assemblies per hr

Tubular parts arc welded automatically

ROY MARTIN, district engineer, THE LINCOLN ELECTRIC CO

Production of gas-operated refrigerators by Servel, Inc, Evansville, depends largely upon welding for the assembly of tubular steel components. Shapes and sizes of these components and the location of welds are such that gas welding by hand is commonly done, and Servel probably does more gas welding than most plants. There are, however, some assemblies well suited to automatic hidden-arc welding, and this is preferred because it is much faster and the welds are of better quality.

For automatic arc welding, specially designed machines are needed, but their cost is moderate and is soon amortized out of savings. The machine is much faster and produces uniformly because human variables are virtually eliminated.

A case in point is the machine for joining two steel tubes for a vertical generator used on box-type evaporators. Two 13-in. longitudinal welds are required, and the work is done on a machine equipped with a Lincolnweld automatic head advanced along a track by a standard-travel carriage.

The tubes are loaded into a fixture and clamped by moving hand levers in front of the fixture. One tube is swaged to a reduced diameter over part of its length and, when the tubes are clamped in the fixture, there is a gap between walls over the reduced diameter length. To prevent burn-through and to bridge the gap, ⅛-in.-dia wire having a slight offset at the step where the reduction begins is laid in the valley between the two tubes before welding.

Loading is done with the head traversed to the left. When the start button is pressed, the head moves from left to right at 60 ipm. As soon as the ⅛-in. L-60 mild steel electrode wire contacts the work, the arc is struck and welding proceeds until the fillet is completed. Current is shut off automatically and the head is elevated and moves backward to the end of its travel. Just before reaching this point, the end of the electrode moves across a star wheel that is pushed upward by a light spring. This cleans off any flux ball adhering to the end, leaving the electrode clean so it will strike an arc immediately when brought into contact with the work.

The wire previously laid in the valley is fused and becomes part of the weld. A strip of fiber attached to the welding head rides on top of the filler wire in advance of the electrode to keep it pressed down so it cannot curl up or be displaced as welding proceeds.

After the first weld is made, the fixture is unlocked, turned through 180°, and locked again. Then a second bead is laid down in the valley, but on the opposite side to the first bead.

Each complete cycle, including loading and unloading, and involving two 13-in. welds, is completed in about 1 min. This is many times faster than any type of hand welding and, as only one man is needed, the labor saving is high. Welds are uniform and of high grade.

Other parts joined by automatic arc welding are the two halves of a cylindrical assembly called an absorber pot. To produce this, the halves are hand clamped and forced together in the two fixtures of a machine designed to rotate the work about a horizontal axis under a fixed automatic head that makes a girth weld. Shells are 4⅝ in. in dia and have been trimmed off square so the ends butt together flush. No chamfers are required, and a flat bead results.

In this machine, ⅛-in. L-60 wire is used and the setup permits the work to be rotated at 40 ipm. Welding time is 21 sec, the weld making a slight lap to insure a tight joint which must hold 1,000 psi pressure. As this machine completes 87 to 100 cycles an hour, loading and unloading included, production is many times faster than for the most expert and rapid hand gas welding. As only one man is required at the machine, and he needs little skill, the cost per weld is low, and the machine, which cost relatively little, has paid for itself many times over out of the savings.

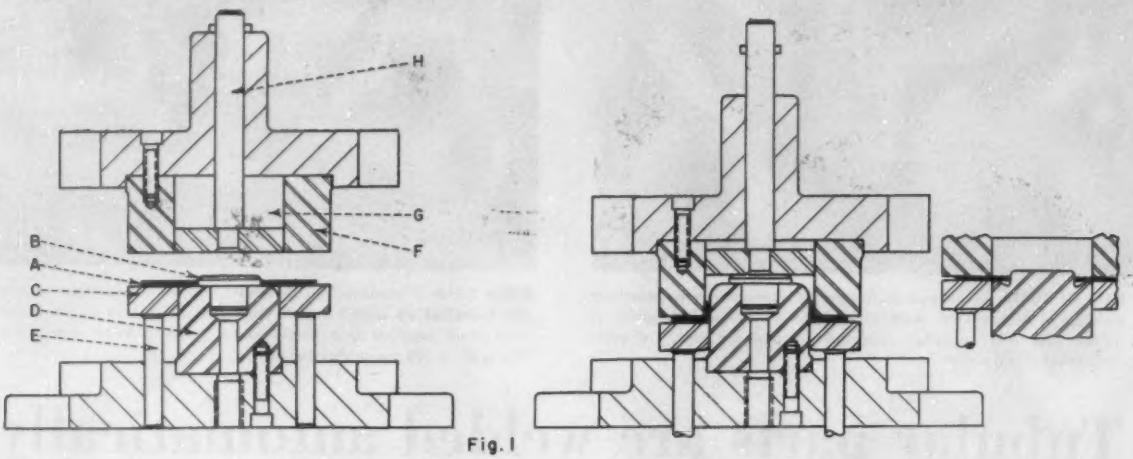


Fig. 1

FIG. 1 . . . Burring punch *D* has a large radius to turn back the metal gradually around the pierced hole in the blank *A*. A higher burr can be produced by machining the punch as in the small view at right

Choice of die type depends

Single-operation or progressive dies can be used to make burrs. The choice depends upon the size of the burr (OD and height), the metal thickness, and whether the work is a blank, strip or a drawn shell

Normal burrs (Installment XIX) can be pierced in a separate operation as shown in Fig. 1, or they can be produced complete in one operation, including blanking and piercing, as shown in Fig. 2 and Fig. 3.

If the burr is low, or the metal is thick, especially if the metal is ironed during the operation, the burr should be formed in a separate die similar to that shown in Fig. 1. In operation of the die, the previously pierced blank *A* is placed over pilot *B* and rests on pressure pad *C*. Pad *C* is normally held flush with the top of burring punch *D* by pins *E*. When the slide descends, burring die *F* grips the blank against the pad and forces the blank and pad downward over punch *D* to form the burr. When the slide ascends, pad *C* strips the burr off punch *D* and the work is carried up inside of die *F*. The stamping is ejected near the end of the upstroke by knockout plate *G* and rod *H*.

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Burring punches are usually designed with a large radius, as shown, to enable the metal to turn back around the hole gradually and without splitting. Recent developments, however, have shown that higher burrs can be produced by machining the punch, as shown in the small view at the right of Fig. 1, and allowing the metal near the base of the burr to form first.

Small burrs can be produced in progressive dies, as shown in Fig. 2. With this die a hole is pierced in the first station by punch *A*. The strip is then advanced to the second station and the hole is burred by punch *B*. Prior to the burring operation a pilot, which is machined on the end of the burring punch, enters the hole to pilot the work. An ejector is provided at *C* to lift the burr from the die hole when the punch rises, so that the strip can be advanced to the next station. In the third station the blank is cut to the proper contour by punch *D*. If separate holes are provided for piloting in the burring station, a pilot is not necessary in the burring punch.

Operation of the die shown in Fig. 3 is as follows: Strip *A* is placed on die ring *B* and is pushed across the die until it strikes stop pin *C*. The press is then tripped. Piercing punch *D*, which extends about ¼ in. below the cutting face of blanking punch *E*, cuts a hole of the correct diameter in the blank. The blank is then cut between rings *B* and *E*, and is gripped against ring *F*. Ring *F* is normally held flush with the top of ring *B* and top of combination burring punch and piercing die *G*. Continued descent of the slide causes blanking punch *E* to push ring *F* down and stretch the metal around the previously cut hole over punch *G* to form the burr.

When the slide rises, the stamping is stripped from between blanking ring *B* and burring punch *G*, and is carried up with blanking punch *E*. The stamping is ejected

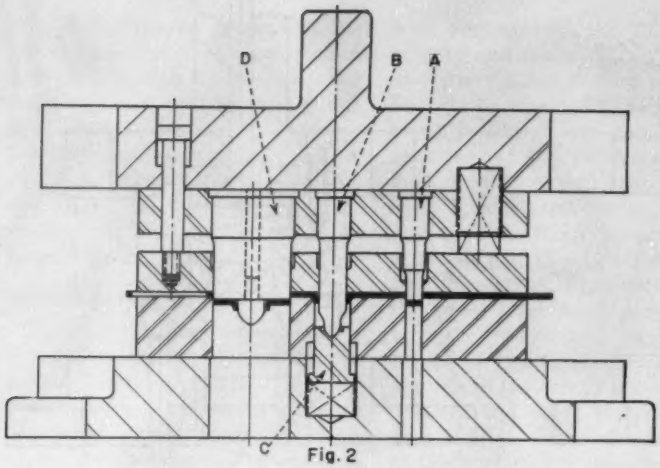


Fig. 2

▶ FIG. 2 ... Progressive die for a small burr has these features: a combination pilot and burring punch *B*, and the ejector *C* to lift the burr so the strip can feed to the blanking station

on the burr

STANLEY R COPE, president,
ACME SCHOOL OF DIE DESIGN ENGINEERING,
SOUTH BEND 1, INDIANA

near the top of the stroke by positive knockout *H*. The strip is prevented from rising with the punch by solid stripper *I*. Slugs drop into a slot which is machined in the bottom of the die holder.

An alternate method of producing small burrs (not over ⅜ in. OD) either progressively or in separate dies is shown in Fig. 4. In the first station, the burr is formed or extruded by punch *A* and die *B*. Punch diameter is made 0.010 less than the hole diameter in the finished burr. Length of the working end of the punch is made 1/64 in. less than the over-all height of the burr, so that a small amount of metal is left in the hole (see enlarged sketch).

In the second station, or operation, the hole is shaved to size and the thin shell of metal at the bottom is removed by punch *C* and die *D*. In the third operation, the stamping is blanked from the strip. Pilots must be provided in the strip to locate the work. A hardened plate

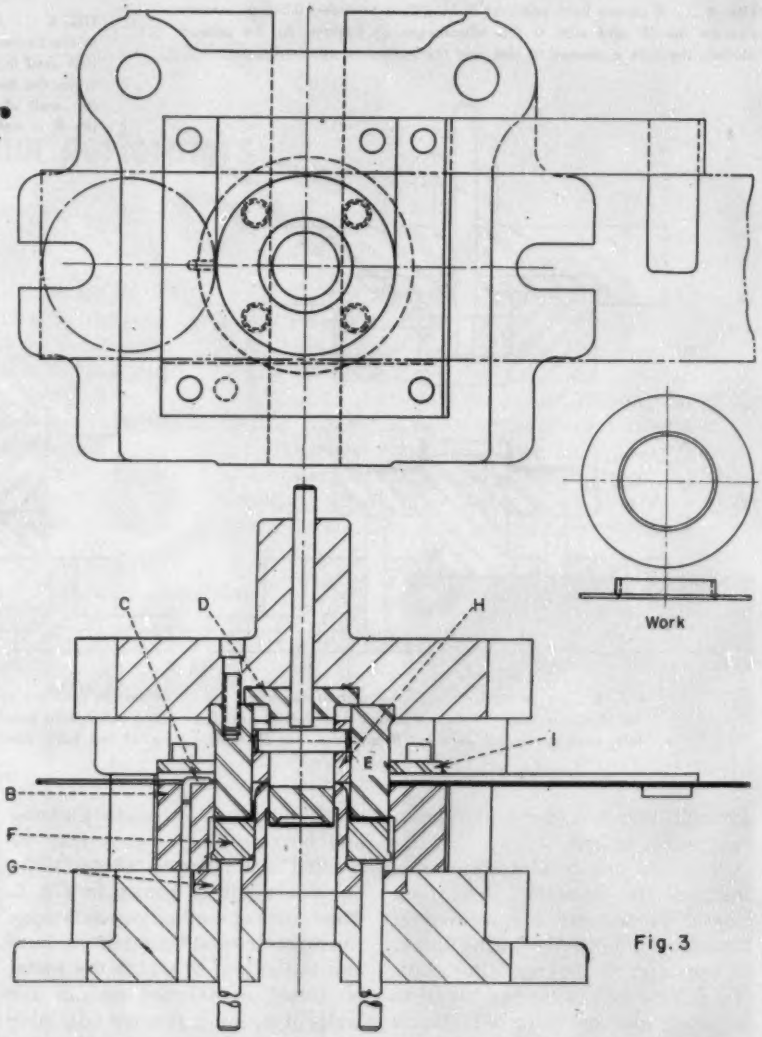


Fig. 3

FIG. 3 ... A single-operation die for making a large burr consists essentially of a piercing punch *D*, the blanking punch *E* and the combination burring punch and piercing die *G*. The pierced and blanked part is gripped between rings *E* and *F* and carried down over the burring punch and piercing die *G* to form the burr

Cope Talks on Draw Dies . . . XX

continued

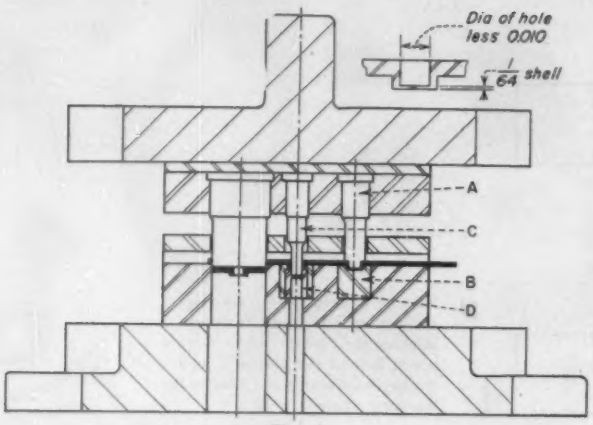


Fig. 4

FIG. 4 . . . A square burr, not over ⅜ in. OD, is extruded 0.010 in. undersize on the ID and with a thin diaphragm at bottom. At the second station, the hole is shaved to size and the bottom is punched out

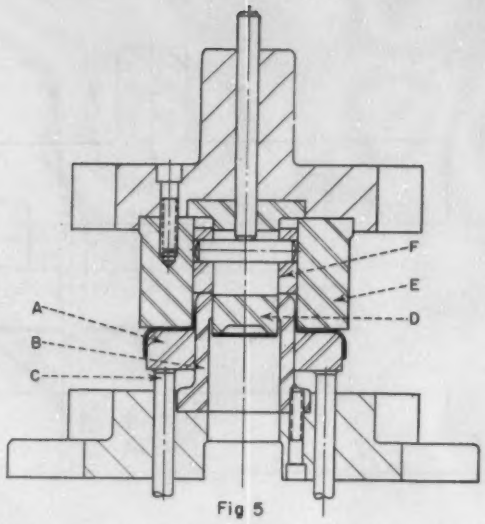


Fig 5

FIG. 5 . . . A shell is placed on pad *A*, and a hole is pierced in the bottom and burred in a manner generally similar to that used in the die shown in Fig. 3. The method is suitable when the burr is not ironed to an appreciable extent, and the wall of the combination burring punch and piercing die *B* is not thin

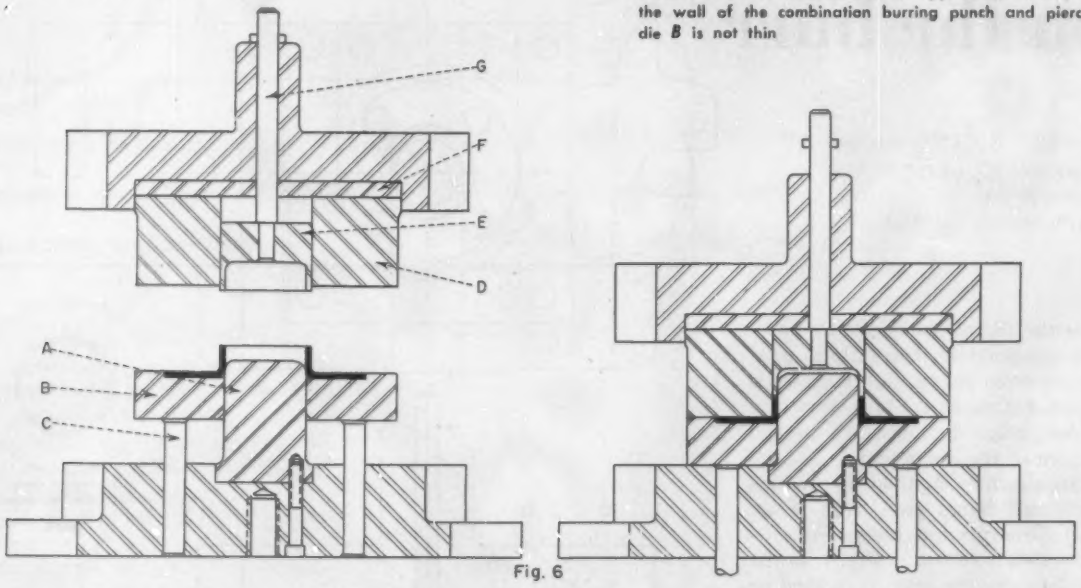


Fig. 6

FIG. 6 . . . In operation of the second-operation die for a square burr, the burred blank is nested in pad *B*, *left*, and is gripped between *B* and die ring *D*, *right*. When the pressure pad bottoms, the combination backfilling punch and knockout *E* forces excess metal at the top of the burr downward, thus filling in the corner

prevents punch *A* from sinking into the punch holder.

If burrs are produced by this method in separate dies, they should be located a considerable distance from the edge of the blank. If the burr is too near the edge, the punch will cause the blank to turn up and be distorted. Burrs produced by this method have unusually smooth holes and are very accurate in height.

Burrs can be formed on drawn shells either in separate piercing and burring dies or they may be pierced and formed complete in one operation, as shown in Fig. 5. The choice of method depends upon the diameter and height of the burr and the extent to which the metal is ironed or thinned out in the walls of the burr. It is not advisable to combine the piercing and burring operations, if the wall of the combination burring punch and piercing die is thin and relatively weak, or if the walls of the burrs are ironed a considerable amount.

The die shown in Fig. 5 works similar to the die illustrated in Fig. 3, except that no blanking takes place. In operation, the shell is located over ring *A*, which is normally held flush with the top of burring punch *B* by pins *C*. When the press slide descends, punch *D* pierces a hole of the correct diameter in the bottom of the shell and burring die *E* grips the shell against

ring *A*. Continued descent of the slide causes die *E* to push ring *A* down and stretch the metal around the previously cut hole over punch *B* to form the burr.

When the slide rises, pad *A* strips the work from the burring punch and the shell is carried up in die *E*. It is ejected near the top by positive knockout *F*.

SQUARE BURRS

Burrs with sharp inner corners are produced in two operations. In the first operation a burr is drawn with a radius to a depth somewhat greater than the depth of the finished burr. The metal is then packed back to fill out the corners and the burr is completed in a die similar to that shown in Fig. 6. In operation, the burred blank is placed over punch *A* and rests on pad *B*. Pad *B* is normally held in the position shown in the open view of the die by pressure pins *C*. If the flange is narrow, the pressure pad should be machined to fit the blank. This will prevent the metal from being pushed back into the flange and causing the blank to swell when pressure is applied to the top of the burr.

When the press is tripped, die ring *D* slips over the outer walls of the burr and pushes the stamping down over the punch. When the pressure pad has bottomed on the die holder, knockout *E*, which is machined to fit snugly between punch *A*, and die ring *D*, reduces the height of the burr and causes the excess metal at the top of the burr to fill out in the corners. A hardened plate is provided at *F* to prevent knockout *E* from sinking into the punch holder.

When the press slide ascends, pad *B* strips the shell from punch *A* and the work is carried up with die ring *D*. The shell is ejected near the top of the stroke.

Part XXI of Mr Cope's series will appear in an early number.

Cut costs with die-shim perforators

J G SCHLINDWEIN, tool supervisor, LYON METAL PRODUCTS, INC, AURORA, ILL

Diemakers usually produce clearance holes for bolts, dowel pins, and punches in die shims by drilling, but this is slow, difficult, and sometimes dangerous. A better way to make the holes is with a dieset and hardened steel punches for common dowel sizes.

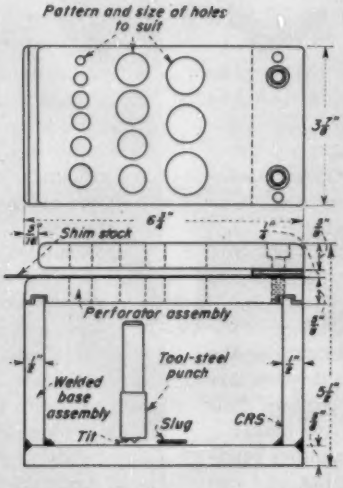
The set has two hardened tool-steel plates with matching holes and punches for various hole sizes. The plates are separated by a ¼-in. spacer along one edge, and are on a welded CRS base.

Here's procedure for making clearance holes:

1. Cut shim to outside dimensions required with a small hand shear.
2. Put shim on die and scribe hole locations.
3. Centerpunch each hole.
4. Locate shim on perforator, aligning holes by setting punch tit in centerpunched depression.
5. Hammer punch to make hole.

Resultant holes are clean, burr-free, and economically made. The shims made in this way fit neatly in position with proper hole clearance.

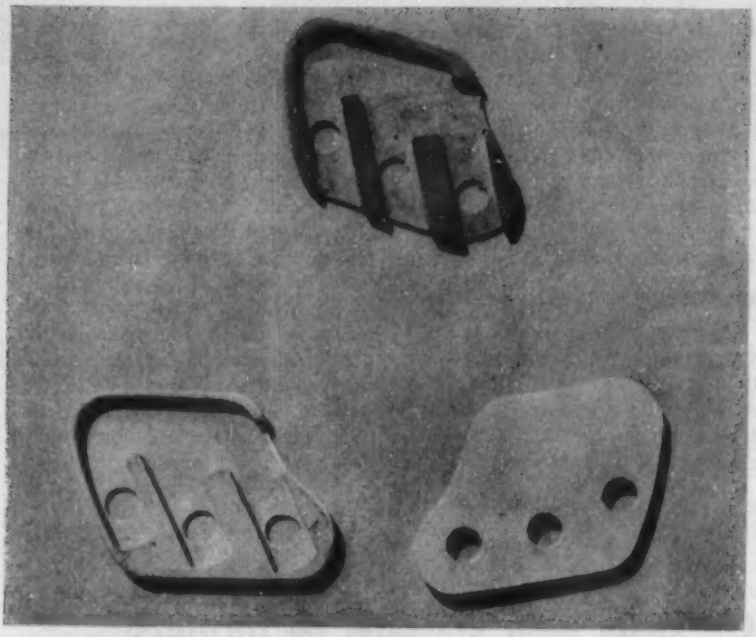
ONE QUICK BLOW usually pierces shim stock to produce hole to clear dowel or punch



BASE here has only two supports; that shown in photos, three. Reason is more throat for larger work done on three-support model

PERFORATOR HOLES range in dia from ¼ to 1 in. Double-U-shaped base clears punches when hammered through

DIE IS ALUMINUM PLATES, machined out and doweled together, with plate interfaces making what would be parting lines on more elaborate dies. Shape here is fairly simple, but any machinable shape can be worked



PARTS ARE GLASS-REINFORCED POLYESTER, and go into small electrical assemblies (like aircraft propeller controls) to support and separate terminals and coils. Part at top is from earlier run; was machined from solid at higher cost

Little dies lick big costs in short-

If a big run is 50 pieces, a plastics jobbing shop has to have something special in the way of equipment if it's to avoid "special" prices. One way around high unit costs is laminated dies, made of easily worked metals, built in jig time with simple tools

EDWARD DOUGLAS, DOUGLAS ENGINEERING CO, MONTEVILLE, N J

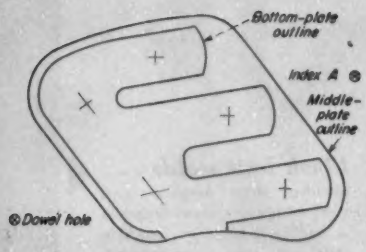
Douglas got into plastics a few years ago because its average lot sizes—from 10 to 25 pc or so—was too small for consideration by a conventional molding shop. Terminal blocks and insulator elements were necessary, however, for the electrical assemblies being made and assembled, so they had to be machined from solid plastic stock.

This was obviously expensive, and continued only until the new "Economold" process (Douglas' name for the idea) was developed. Now a plastic assembly element can be produced within about a week of the order date, and the price can be written off on the order without a high die charge. Mold costs are actually about a fifth to a tenth of the costs of conventional high-production, single-cavity molds.

Mold stock is aluminum because it machines readily, holds up long enough for normal runs, and can easily be repaired with hand tools if dimensions start drifting out. Tolerances of 0.010 in. can be held without trouble for 50 shots, and closer work can be handled with more careful machining and patient hand touchup work. Stock is bought in thicknesses to suit the job, usually, or can be faced off if a standard thickness isn't quite right.

There are some chosen limitations on the process. No thermoplastics are worked to simplify the press equipment required. Such materials as phenol formaldehydes, melamines, and glass-reinforced polyesters are worked; but poor-flowing thermosetting materials are avoided. Parts up to 2 oz are molded; and practically any shape can be handled—as long as the die can be made and parting lines can be arranged to get the molded parts out. Die dimensions usually include about 0.005 in. per in. allowance for shrinkage.

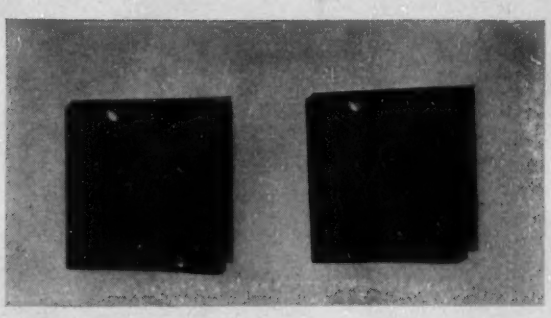
Savings are great. In the case of the part shown, a regular production die might have cost about $400. The "Economold" die cost about $75.



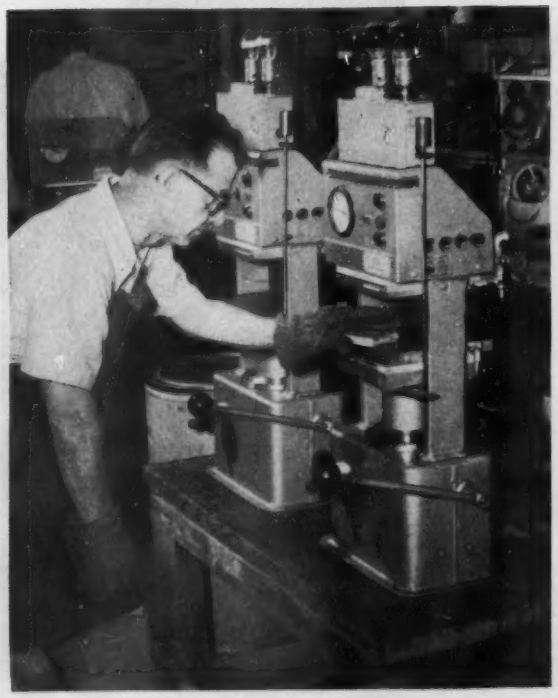
DIE LAYOUT IS COMPOSITE DRAWING of part shapes, all imposed on one sketch. Pantograph operator picks up proper outline for whichever die plate he is tracing. Layout is made from part drawing or sample product

▶ **LAYOUT LOFT HAS HOME-MADE PANTOGRAPH** working at 10:1 from large die layout to scribe die plates (left). Fairly careful line following provides enough accuracy on die plates

run plastics

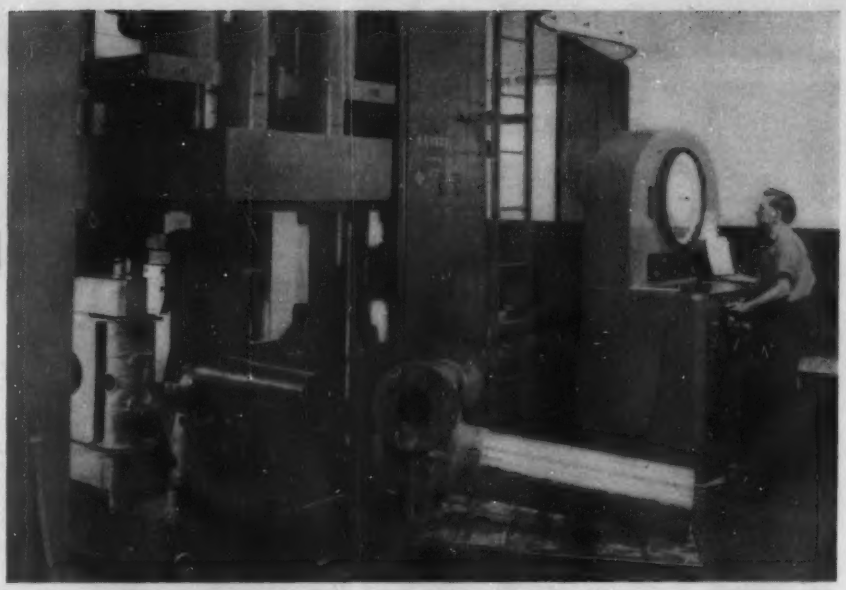


BLUED AND SCRIBED DIE PLATES are ready for machining to 0.01-in. accuracy or closer as required. Closer work requires only more care; perhaps some file work



DIE FILER IS FOR FINAL TOUCHUP on die plates and for corrections and adjustments if plates wear during run. If die goes bad at a thin section, for example, parts may be machined to final dimension if not much work is necessary

▶ **MOLDING PRESS** is a small hydraulic unit adequate for parts up to 2 oz. Die-closing pressures run to 40,000 psi



Flash butt welds . . . between drop forgings and steel tubing are proof-tested in a million-lb-capacity machine that will take cross-sectional areas up to 67 sq in. and diameters up to 30 in. Part is aircraft landing-gear component that is tested in four positions in special fixture. Welding the units instead of forging complete permits smaller machines for production; less final weight in gear. Test setup is at Chicago Pneumatic Tool Co. *Baldwin - Lima - Hamilton Corp, Philadelphia, Pa*

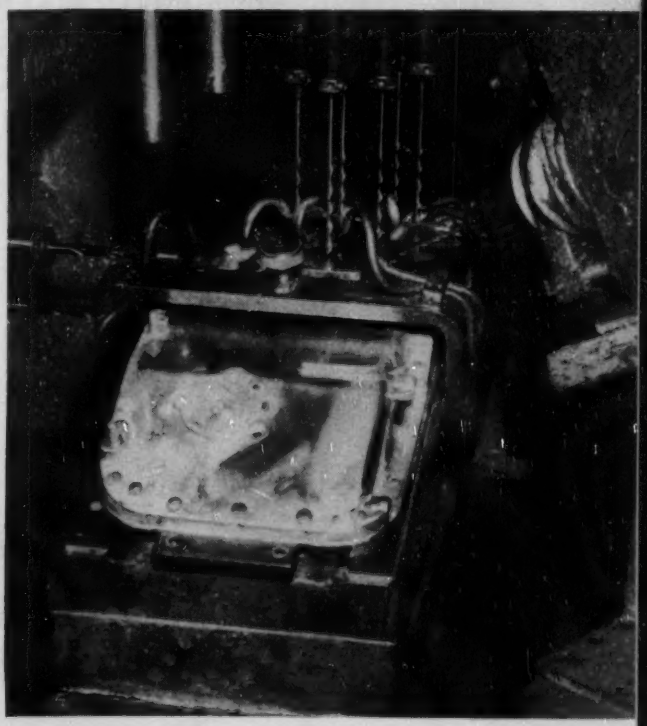
SHOP SHOTS

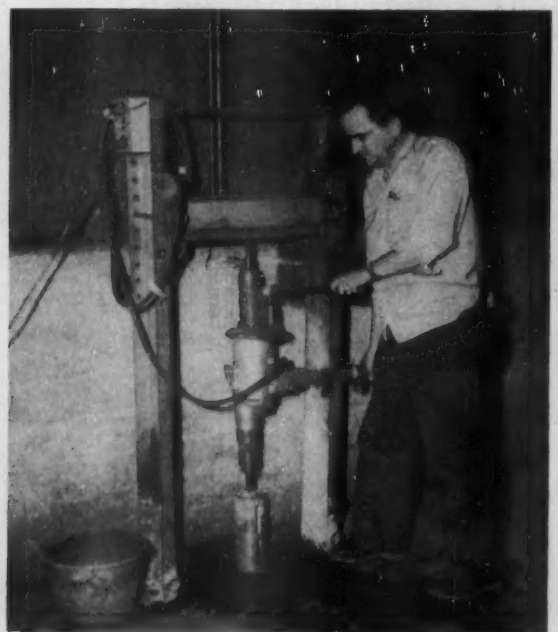
Tension pads are pulled . . . with solid CO_2. After tests have been made on aircraft surfaces, the 4-in.-sq pads are cooled with solid CO_2, then pried up. Method replaces old system of using hacksaw or electric iron, which destroyed pads that cost $60,000 a year. Now they can be used over again. *Consolidated Vultee Aircraft Corp, San Diego, Calif*

Gang channel nuts hold sections . . . of large aircraft fuel tanks together. Aluminum channels hold steel nuts with nylon inserts that prevent leakage when assembly is completed at Ryan Aeronautical Co. Four rivets hold channels in place until sections are joined. Nuts are gripped and prepositioned by formed channel so they are correctly aligned. *Elastic Stop Nut Corp, Union, N J*

Gearbox housing . . . is vacuum impregnated with a thermosetting resin that fills pores in the magnesium castings. Clean castings are subjected to vacuum for an hour, then the plastic is introduced into the tank. After half an hour, pressure is built up to 100 psi and held for an hour. This installation is at York Gears, Ltd, Toronto, Canada. Gearbox is for jet-engine compressor rotor. *F J Stokes Machine Co, Philadelphia*

Four power heads . . . drill holes simultaneously in this gas-tank bottom at McCullough Motors. To locate magnesium die casting firmly against pressure of angle drills without distorting it, a standard torque thumbscrew releasing at 16 to 18 lb is included in top bracket. When screw is spun against part, the head releases at torque limit and spins on screw portion, forming a positive stop of limited pressure. Turning knurled head counterclockwise after drilling releases part for unloading. *Vlier Engineering, Inc, Los Angeles*





Jack pushes masonry drill . . . to provide necessary 2000-lb force that makes cutter operate properly. Heavy-duty 1¼-in. electric drill is bolted to 3-ton hydraulic jack, and the unit is installed under "H"-frame that is adjustable up and down. Frame is anchored to floor with bolts, or to wall with bolts and supported by pipe legs that fit in four sockets visible on front of frame. As drill cuts, jack is operated to force cutter into concrete. *Continental Electrical Construction Co, Chicago*

Promises, Promises

"I'd like to know how I can tell the Super when this job will be done, when even the guy working on it doesn't know."

"Why don't you try the old promise system, Ed? It used to work, they tell me."

"What's the promise system, and what makes you think any promise from these hoodlums is worth anything, Al?"

"Well, each guy guesstimates how long a job will take when he starts out on it. He has to think about it, to make a sensible promise, so you have the advantage of his estimate. Then he makes out a little note, gives you a copy and keeps one, and then he tries to make the job come out on time."

"That's a great idea for ready-made alibis for loafing, Al. All he has to do is overestimate his time 50% and he has a free afternoon."

"Oh, he has to make the guess reasonable, Ed. Part of the advantage is that it makes you think about it, too, and then you both come to some sort of conclusion about how long the job should take."

"What if the worker and I don't agree? I say it's an hour job, and he says a day. What then?"

"You couldn't disagree that much, Ed. Besides, the idea behind the promise is to make the two of you arrive at a sensible figure. If you start an argument about the time, at least you're both seriously considering the thing. Then you have a reasonable estimate for the length of the job."

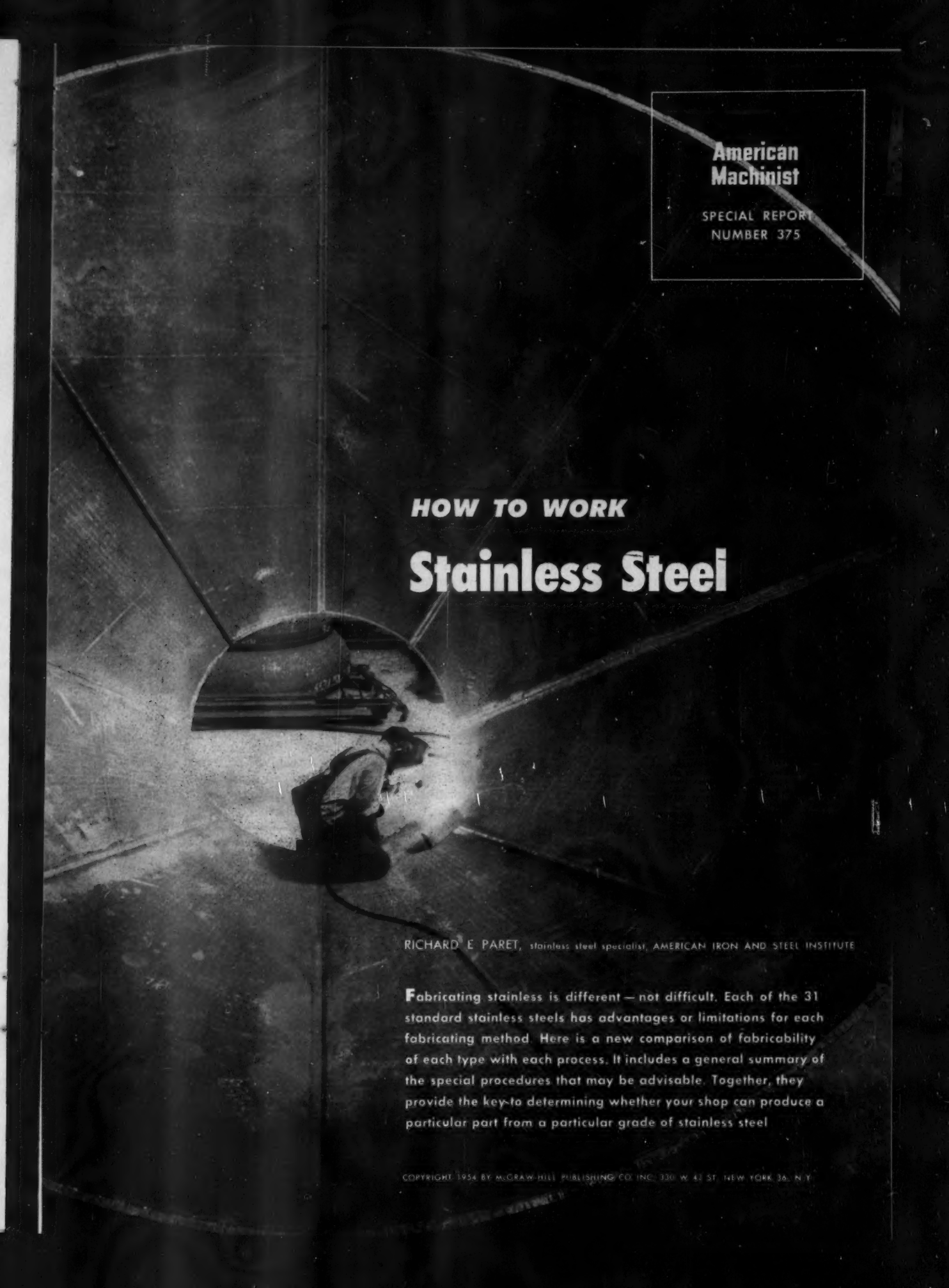
"We'd spend all day fighting over it, Al."

"Not really, Ed. Besides, the promise isn't really binding. If the man can't make the date, he gets another piece of paper and adds an hour or two to the original promise. He doesn't get bawled out if he runs over, and sometimes he might even get a job out ahead of promise."

"The whole idea's too shaky, Al. I'm afraid it wouldn't be worth the trouble."

"Wouldn't it at least give you a finished date to mention to the Super? Why not give it a try, Ed?"

***WHAT** shop man would put in writing an expected completion date for a job? Or could Al have a germ of an idea that might help out in estimating work loads and dates for finished work? Your opinions can be helpful to others. Discussions of earlier topics appear on later pages.*



American Machinist

SPECIAL REPORT
NUMBER 375

HOW TO WORK

Stainless Steel

RICHARD E. PARET, stainless steel specialist, AMERICAN IRON AND STEEL INSTITUTE

Fabricating stainless is different — not difficult. Each of the 31 standard stainless steels has advantages or limitations for each fabricating method. Here is a new comparison of fabricability of each type with each process. It includes a general summary of the special procedures that may be advisable. Together, they provide the key to determining whether your shop can produce a particular part from a particular grade of stainless steel

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Stainless may cost less to fabricate

Stainless steels are readily available materials with high strength, high corrosion resistance and generally excellent workability. Type 305 stainless has been drawn 72% in the first draw in several production pieces. Pen caps of the austenitic stainless steels are drawn well over 80% in a series of operations without annealing. Less severe draws are routine, as are stamping, spinning, and bending.

The higher strengths of the stainless steels require greater power in working operations. Modifications in die design may be necessary because of springback. Ironing should be avoided. But in many cases, thinner stock can be selected because of the greater strength of stainless — reducing the power required.

In machining operations, the toughness and strength of stainless steels results in a certain amount of "gumminess." To avoid this, special free-machining grades have been developed with 85 to 90% of the machinability of Bessemer screwstock.

For weldability, the austenitic (chromium-nickel) types are unexcelled. Welded joints in these steels are strong, tough, and ductile; they require no subsequent heat-treatment to improve their physical properties.

Any metal has special rules for fabrication, and stainless is no exception. Sometimes stainless may cost less to fabricate than mild steel. Savings are possible because of the elimination of rusting problems while work is in progress and elimination of special operations designed to prevent such rust. A saving may result from the elimination of heat-treating necessary with other materials to bring them up to the strengths inherently possessed by stainless.

Each of the 31 standard types of stainless steel has advantages or limitations for given fabrication processes. The superiority of one type over another for a particular operation (or series of operations) is a matter of degree. Composition of each type together with a brief indication of its special characteristics is given in the first table, while the suitability of each type for each method of fabrication is shown in the second table.

AISI types of stainless steel

Martensitic types: 403, 410, 414, 416, 420, 431, 440A, 440B, 440C

The steels in this group are hardenable, because they have a high carbon-to-chromium ratio to undergo the necessary transformations. Their best mechanical as well as corrosion-resisting properties are found in the hardened condition. Tensile strengths run from 70,000 to 105,000 psi when annealed to 125,000 to 200,000 psi when hardened.

Thermal conductivity of the martensitic stainless steels is low, but still the best of the stainless family. They are especially suitable for hot working or forging. These types are air-hardening, and must be slowly cooled (or annealed) after forging to prevent cracking. Their cold-forming characteristics are fair.

The martensitic types are well suited for most moderately corrosive applications requiring high strength, hardness, and resistance to abrasion and wet and dry erosion.

Ferritic types: 405, 430, 430F, 446

The ferritic types are not hardenable, because they have a lower carbon-to-chromium ratio which reduces the effect of the transformation responsible for hardening. But while they can't be hardened by heat treating, hardness can be increased slightly by cold working. In practice, however, these steels are only rarely used in the cold-worked condition, because the small increase in hardness obtainable is accompanied by a relatively large decrease in ductility.

The ferritics have a lower coefficient of expansion than the austenitic stainless types—about the same or slightly less than carbon steel. They also offer good resistance to oxidation and corrosion, and are often selected for these reasons.

While their ductility is less than that of the chromium-nickel types, they can be fabricated without difficulty by such methods as forming, bending, spinning, and shallow drawing. And they can be buffed to a high finish. Welding is possible, but welds may tend to be brittle—which usually can be overcome with proper heat-treatment. A special welding grade, type 430T, contains titanium and has excellent weldability.

These types have higher resistance to corrosion and oxidation than the martensitic types. Like the martensitic types, the ferritics also are magnetic in all conditions.

AISI Standard and Tentative Standard Types of Stainless Steels

Type No.	C	Mn Max.	Si Max.	Cr	Ni	Other	Remarks[1]
301	Over .08-.20	2.00	1.00	16-18	6-8	—	Rapid work-hardening
302	Over .08-.20	2.00	1.00	17-19	8-10	—	General-purpose chromium-nickel type
302B	Over .08-.20	2.00	2-3	17-19	8-10	—	Higher scaling resistance
303	0.15 max.	2.00	1.00	17-19	8-10	3	Free-machining
304	0.03 max.	2.00	1.00	18-20	8-11	—	General purpose—welding
304L	0.03 max.	2.00	1.00	18-20	8-11	—	Weldments for severely corrosive conditions
305	0.12 max.	2.00	1.00	17-19	10-13	—	Low work-hardening rate
308	0.08 max.	2.00	1.00	19-21	10-12	—	Welding rod and electrodes
309	0.20 max.	2.00	1.00	22-24	12-15	—	High scale resistance and good strength at high temperatures
309S	0.08 max.	2.00	1.00	22-24	12-15	—	Weldments with high scale resistance, good strength
310	0.25 max.	2.00	1.50	24-26	19-22	—	Like 309 but even higher heat resistance
310S	0.08 max.	2.00	1.50	24-26	19-22	—	Like 309S but even higher heat resistance
314	.025 max.	2.00	1.50-3	23-26	19-22	—	Highest heat resistance
316	0.10 max.	2.00	1.00	16-18	10-14	Mo 2-3	Higher resistance to certain corrosives
TS 316[2]	0.10 max.	2.00	1.00	16-18	10-14	Mo 1.75-2.5	which can affect other stainless steels, such
316L	0.03 max.	2.00	1.00	16-18	10-14	Mo 1.75-2.5	as halide salts. Also high creep resistance
317	0.10 max.	2.00	1.00	18-20	11-14	Mo 3-4	at high temperatures. TS 316 is alloy-conservation version. 316L is version for weldments. 317 is higher in corrosion and creep resistance.
321	0.08 max.	2.00	1.00	17-19	8-11	Ti 5xC min.	For weldments subject to severely corro-
347	0.08 max.	2.00	1.00	17-19	9-12	Cb 10xC min.	sive conditions and/or service in 800-1650
TS 347[2]	0.08 max.	2.00	1.00	17-19	9-12	Cb 8xC min.	F temperature range
TS 347A[2]	0.08 max.	2.00	1.00	17-19	9-12	Cb-Ta 8xC min.	
403	0.15 max.	1.00	0.50	11.5-13	—	—	Steam turbine blades
405	0.08 max.	1.00	1.00	11.5-13.5	—	Al 0.10-0.30	Low hardenability
410	0.15 max.	1.00	1.00	11.5-13.5	—	—	General-purpose. Hardenable by heat treatment
414	0.15 max.	1.00	1.00	11.5-13.5	1.25-2.5	—	High-strength version of 410
416	0.15 max.	1.25	1.00	12-14	—	3	Free-machining
420	Over 0.15	1.00	1.00	12-14	—	—	High hardness from heat treatment. Cutlery.
430	0.12 max.	1.00	1.00	14-18	—	—	General-purpose chromium type
430F	0.12 max.	1.25	1.00	14-18	—	3	Free-machining
431	0.20 max.	1.00	1.00	15-17	1.25-2.5	—	Special-purpose hardenable
440A	0.6-0.75	1.00	1.00	16-18	—	Mo. 75 max.	High strength and corrosion resistance. Hardenable by heat treatment
440B	0.75-0.95	1.00	1.00	16-18	—	Mo. 75 max.	Cutlery grade
440C	0.95-1.20	1.00	1.00	16-18	—	Mo. 75 max.	Ball bearing grade
446	0.35 max.	1.50	1.00	23-27	—	N 0.25 max.	Resistance to high-temperature scaling and hot sulfur-bearing gases

[1]Remarks are indicative of primary characteristics or uses, but because of space limitations cannot be definitive.
[2]TS grades were developed to meet limitations set by the National Production Authority in 1951.
[3]Phosphorous or sulfur or selenium: 0.07 min — zirconium or molybdenum: 0.60 maximum.

Austenitic types: 301, 302, 302B, 303, 304, 304L, 305, 308, 309, 310, 310S, 314, 321, 347, 316, 316L, 317

Steels in this group possess the highest corrosion resistance in the family of stainless steels. Austenitic stainless steels are inherently tough and well-adapted for fabrication by deep drawing and other similar means. They can be welded easily, and also can be soldered by proper technique. Type 303, a special free-machining grade, contains such additives as sulfur or selenium for excellent machinability.

The austenitic stainless steels cannot be hardened by heat-treatment; they also are non-magnetic. These steels have unusually high ductility. Tensile strength in the annealed condition is considerably above that of mild steel—approximately 90,000 psi as

compared with approximately 50,000 psi. Austenitic stainless has a yield point of approximately 35,000 psi—comparable with that of mild steel.

These steels can be work hardened to extremely high tensile and yield strengths and still maintain good ductility. Tensile strengths up to approximately 200,000 psi can be developed in flat-rolled products, and in excess of 300,000 psi in fine-drawn wire. Because of this work-hardening characteristic, it is sometimes necessary to re-anneal the material between operations in certain fabricating processes such as drawing or spinning. Some grades, especially types 301 and 302 are frequently used in harder tempers for structural and other high strength purposes in aircraft, railway cars and trucks and trailers

Fabricating stainless steels

CUTTING

Stainless is stronger and tougher than ordinary carbon steels, so heavier tools and more rigid equipment are desirable for any type of cutting operation. From 30 to 50% greater shear capacity is usually required. Shear blades should be made from high-speed steel, ground with as great a lip clearance as possible, maintained sharp, and set close. The martensitic and ferritic stainless steels present no special problems; however, the austenitic types require especially close adjustment of shear blades. Especially with the austenitic stainless steels, it is necessary to cut further through the thickness of metal, for pieces will not snap off when partially cut through as soon as will other metals.

The higher toughness and strength of stainless requires more power and slower speeds for blanking and punching. It is normal practice to put a shear on punch faces to reduce the load on the equipment. The best grades of tool steels should be used. Punches and dies should be kept sharp. The austenitic stainless steels are somewhat more difficult to blank and punch than the other grades. Small clearances should be maintained to keep the metal from being drawn into the die. A general rule of thumb is to work to a clearance of 1/10 the thickness of the metal being blanked or punched.

In perforating, from 75 to 100% more force will be required than for mild steel. Press speed should be reduced by 50 to 60%. Again, care should be taken in setting clearances for all three types of stainless—with the austenitic types requiring especially close clearance. Holes to be perforated should not be smaller in diameter than the thickness of the material being used: recommended minimum

Workability chart

Relative workability ratings for the different stainless steels in the austenitic, martensitic, and ferritic groups are indicated. In all cases, suitability is based on the realization that these are stainless steels of three separate families. Inter-family relationships are discussed in the article.

In the martensitic steels, type 410 is considered as the mean; variations are indicated as deviating from it. Similarly, in the ferritic steels, type 430 is the mean, and in the austenitic steels, type 302 is the mean.

There is no attempt to correlate among groups. The basic performance of one group may be better or worse than another.

Notes:

a. Slightly greater care required because of the high chromium content.

b. Because of the "gumminess" of these austenitic steels, slower speeds and low feeds are necessary.

c. For reference, comparative machinability figures:

Bessemer Screw Stock	100
416	85
430F	90
303	75
302	45
430	54

(based on cold-finished stock)

d. Free-machining steels are somewhat susceptible to hot shortness. Temperatures must be controlled within close limits.

e. These steels, because of the elevated temperature strength require higher pressures and special die considerations.

f. More power, smaller cuts necessary because of the greater hardness of annealed steel.

g. Additions to improve machining characteristics lessen formability.

h. Higher work hardening characteristics of this grade make it less suitable for any but the more shallow draws.

i. Somewhat more difficult to draw than the basic type; generally drawn only when ultimate use necessitates these alloys.

j. Higher silicon content may necessitate special care to avoid cracking.

k. These steels show freedom from harmful carbide precipitation caused by welding heat. They are not necessarily easier to weld so far as the mechanical operations of welding are concerned.

l. Can be welded but pre-heating, post-heating, or both usually will be required to prevent cracking.

m. Discontinuities in high polishes and finishes.

n. Formability restricted because of the greater hardness of annealed steel.

Comparative fabricability table for annealed stainless steels

	MARTENSITIC TYPES (AISI)									FERRITIC TYPES (AISI)				AUSTENITIC TYPES (AISI)																	
	HARDENABLE BY HEAT TREATING									NON-HARDENABLE				WORK HARDENABLE																	
														18 – 8's						Higher Cr – Ni						18 – 8 Stabilized		18 – 8 With Molybdenum		
	403	410	414	416	420	431	440A	440B	440C	405	430F	446	446	301	302	302B	303	304	304L	305	308	309	309S	310	310S	314	321	347	316	316L	317
CUTTING																															
SHEARING	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
BLANKING	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
PERFORATING	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
NOTCHING	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
SLITTING	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
EXPANDING	2	2	2	2	2	2	2	2	2	2	2	2	3a	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
PUNCHING	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
MACHINING																															
TURNING	2	2	2	1	3f	2	3f	3f	3f	2	2	1	2	2	2	2	1	2	2	3b	3b	3b	3b	3b	3b	3b	3b	3b	3b	3b	3b
MILLING	2	2	2	1	3f	2	3f	3f	3f	2	2	1	2	2	2	2	1	2	2	3b	3b	3b	3b	3b	3b	3b	3b	3b	3b	3b	3b
DRILLING	2	2	2	1	2	2	3f	3f	3f	2	2	1	2	2	2	2	1	2	2	3b	3b	3b	3b	3b	3b	3b	3b	3b	3b	3b	3b
TAPPING	2	2	2	1	2	2	3f	3f	3f	2	2	1	2	2	2	2	1	2	2	3b	3b	3b	3b	3b	3b	3b	3b	3b	3b	3b	3b
BORING	2	2	2	1	3f	2	3f	3f	3f	2	2	1	2	2	2	2	1	2	2	3b	3b	3b	3b	3b	3b	3b	2	2	3b	3b	3b
REAMING	2	2	2	1	3f	2	3f	3f	3f	2	2	1	2	2	2	2	1	2	2	3b	2	2	2	2	2	2	2	2	2	2	2
PLANING	2	2	2	1	3f	2	3f	3f	3f	2	2	1	2	2	2	2	1	2	2	3b	3b	3b	3b	3b	3b	3b	2	2	2	2	2
BROACHING	2	2	2	1	3f	2	3f	3f	3f	2	2	1	2	2	2	2	1	2	2	3b	3b	3b	3b	3b	3b	3b	2	2	3b	3b	3b
FORMING																															
FORGING	2	2	2	3d	2	2	2	2	2	2	2	3d	2	2	2	2	3d	2	2	2	2	3e	3e	3e	3e	3e	2	2	3e	3e	3e
BENDING	2	2	2	3g	3n	2	3n	3n	3n	2	2	3g	3a	2	2	2	3g	2	2	2	2	2	2	2	2	2	2	2	2	2	2
ROLL FORMING	2	2	2	3g	3n	2	3n	3n	3n	2	2	3g	3a	2	2	2	3g	2	2	2	2	2	2	2	2	2	2	2	2	2	2
DRAWING	2	2	3n	3g	3n	3n	3n	3n	3n	2	2	3g	3a	3h	2		3g	2	2	1	3i	3i	3i	3i	3i	3i	2	2	2	2	2
STAMPING	2	2	3n	3g	3n	3n	3n	3n	3n	2	2	3g	2	3h	2		3g	2	2	2	2	2	2	2	2	2	2	2	2	2	2
HYDROFORMING	2	2	2	3g	3n	2	3n	3n	3n	2	2	3g	2	3h	2		3g	2	2	2	2	2	2	2	2	2	2	2	2	2	2
SPINNING	2	2	3n	3g	a 3n	3n	4	4	4	2	1	3g	3a	3h	2		3g	2	2	1	2	2	2	2	2	2	2	2	2	2	2
JOINING																															
FUSION WELDING	3l	3l	3l	4	3l	3l	3l	3l	3l	1	2	4	3a	2	2	3j	4	2	1k	2	2	2	2	2	2	3j	1k	1k	2	1k	2
RESISTANCE WELDING	2	2	2	4	3l	2	2	2	2	2	2	4	3a	2	2	3j	4	2	2	2	2	2	2	2	2	3j	2	2	2	2	2
SILVER BRAZING	2	2	2	4	2	2	2	2	2	2	2	4	3a	2	2	2	4	2	1k	2	2	2	2	2	2	2	1k	1k	2	1k	2
HI-TEMP SOLDERING	2	2	2	4	2	2	2	2	2	2	2	4	3a	2	2	2	4	2	1k	2	2	2	2	2	2	2	1k	1k	2	1k	2
SOLDERING	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
RIVETING	1	1	2	4	4	2	4	4	4	1	1	4	2	3h	2	2	3g	2	2	1	2	2	2	1	1	1	2	2	2	2	2
FINISHING																															
POLISHING	2	2	2	3m	2	2	2	2	2	2	2	3m	2	2	2	2	3m	2	2	2	2	2	2	2	2	2	3m	2	2	2	2
PLATING	2	2	2	3m	2	2	2	2	2	2	2	3m	2	2	2	2	3m	2	2	2	2	2	2	2	2	2	3m	2	2	2	2

CODE: 1 – Exceptionally good 2 – Well suited (norm) 3 – Precautions Necessary (see footnote references) 4 – Better not, try another material.

FELT PADS on hold-downs protect finish of stainless sheet in shearing operation

diameter is 1½ to 2 times the thickness of the material.

Lubricants are advised. And flattening or annealing operations may be required after any severe cutting operation.

MACHINING

Machining operations require sharp tools rigidly mounted, operated at proper speeds, and use of a cutting fluid. The latter generally is a sulfur-base oil. Ferritic stainless steels are easiest to machine; the annealed martensitic types are somewhat more difficult; and the austenitic types, because of their work-hardening properties, are the most difficult. Special care should be taken with the austenitics, since their machining is rendered very difficult if tools are allowed to ride (glaze) and thereby work-harden the surface to be cut.

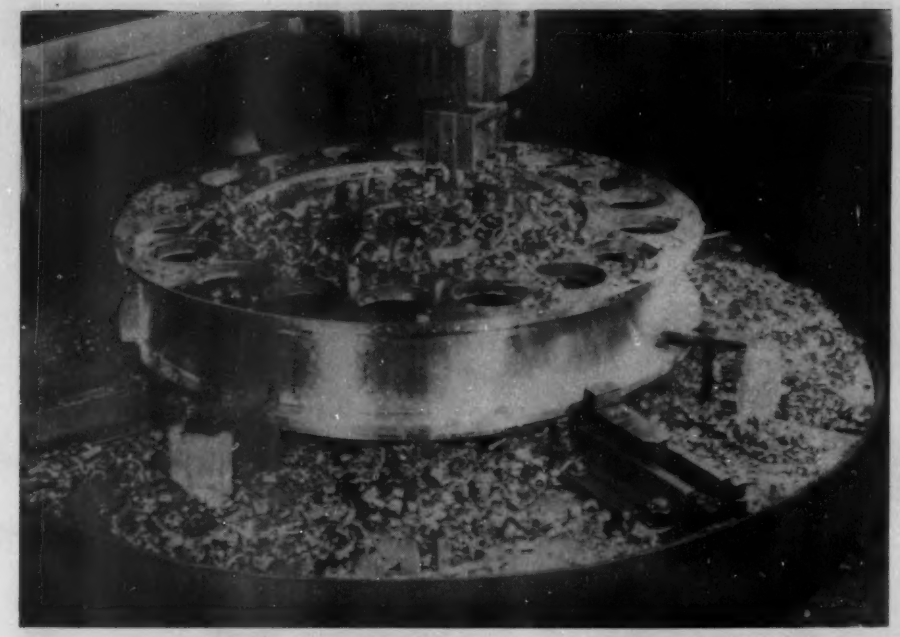
Stainless types 430F and 416 have been developed especially for machining purposes. Type 430F can be machined at rates approximately 80 to 90% of Bessemer screw stock; type 416, approximately 75 to 80% of Bessemer screw stock. If a non-machining grade is selected for higher mechanical or corrosion-resistant properties necessary in the finished product, some sacrifice in machining properties will have to be made.

Here are essential practices for good machining of the stainless steels—they are equally applicable to other materials:

1. Maintain a high degree of rigidity in tools, toolholders, and equipment. No backlash.
2. Polish working faces of tools and keep cutting edges sharp.
3. Use a good coolant or lubricant in sufficient quantities. Cooling ability is important, but in most stainless-steel machining it is more desirable to prevent heat from building up in the first place. High-quality sulfur-base oils are usually used; however, soluble oils prove superior for clearing chips —especially in deep drilling.
4. Use sufficient power to maintain constant speeds. Data on correct feeds and speeds are available from the individual stainless producers and distributors.

Forging Range Temperatures

Type	Maximum °F	Finishing °F	Cooling Rate
Austenitic	2300	1600	Very Rapid
Ferritic	2050	1450	Rapid
Martensitic	2200	1500	Slow



INTERRUPTED CUTS on Type 304 stainless casting with 18 cored holes made with cast-alloy Haynes Stellite tool. A ¼-in. cut is taken at 100 fpm with feed of 1/16 ipr. Removal rate is 20 cu in. per min

PERFORATED PANEL for water cooler is protected by kraft paper at ends of louvers during forming operation

5. If equipment is sufficiently rigid, there is a great advantage in using high-speed or carbide tools. They permit significant increases in working speeds.

Drills—Use flatter angles such as 140° instead of the conventional 118°. Keep drills short, rigidly mounted.

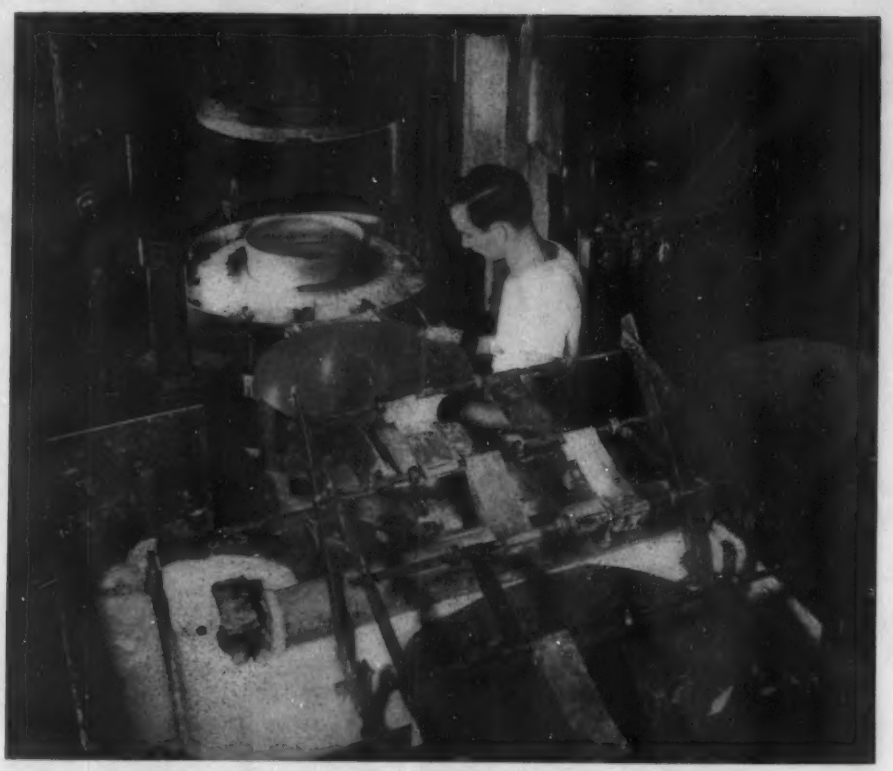
Reamers—For general work use a high-speed, spiral-fluted reamer with 30° lead or chamfer, and mounted, if possible, in a floating holder.

Milling Cutters—Use higher top rake angles, slower speeds.

Taps—Keep them sharp. A 50% thread is preferred—75% maximum. Take precautions to prevent chip jamming.

The same rules used for drilling other materials also apply to stainless. Drill speeds decrease as diameters increase, and feeds increase as diameters increase. Special drills for stainless steel are now being offered by some manufacturers. In general, drill speed will be about half that for mild steel.

In laying out work, use as small a triangular punch as possible to minimize work-hardening. Maintain



BLANKS for beer-barrel heads are roller-coated with lubricant in foreground then deep drawn in hydraulic press

a steady feed while drilling to prevent work hardening of the bottom of the hole.

Reciprocating saws are used for sawing the stainless steels. Refer to saw manufacturers' data for correct speeds and feeds. High-speed band saws with dull, friction teeth and high-speed abrasive disk cutting are successful.

FORGING

Stainless steels can be forged without difficulty provided proper precautions are observed. With low heat conductivity and greater strength at elevated temperatures, heating must be done more slowly, and an average of 25% more blows under the hammer will be required than for plain carbon steels. Forging die life in stainless-steel operations is about 25% less than for mild steels.

Forging temperatures vary for the different stainless steels. Approximate figures are shown in the table on page 134.

Muffle or semi-muffle furnaces with accurate pyrometric control are recommended. Heating in direct contact with an open flame produces carburization and possible loss of corrosion resistance.

BENDING AND ROLL FORMING

Stainless is often bent or formed in conventional bending brakes. Where production warrants, continuous lengths can be formed in elaborate cross sections with a progressive series of shaped forming rollers.

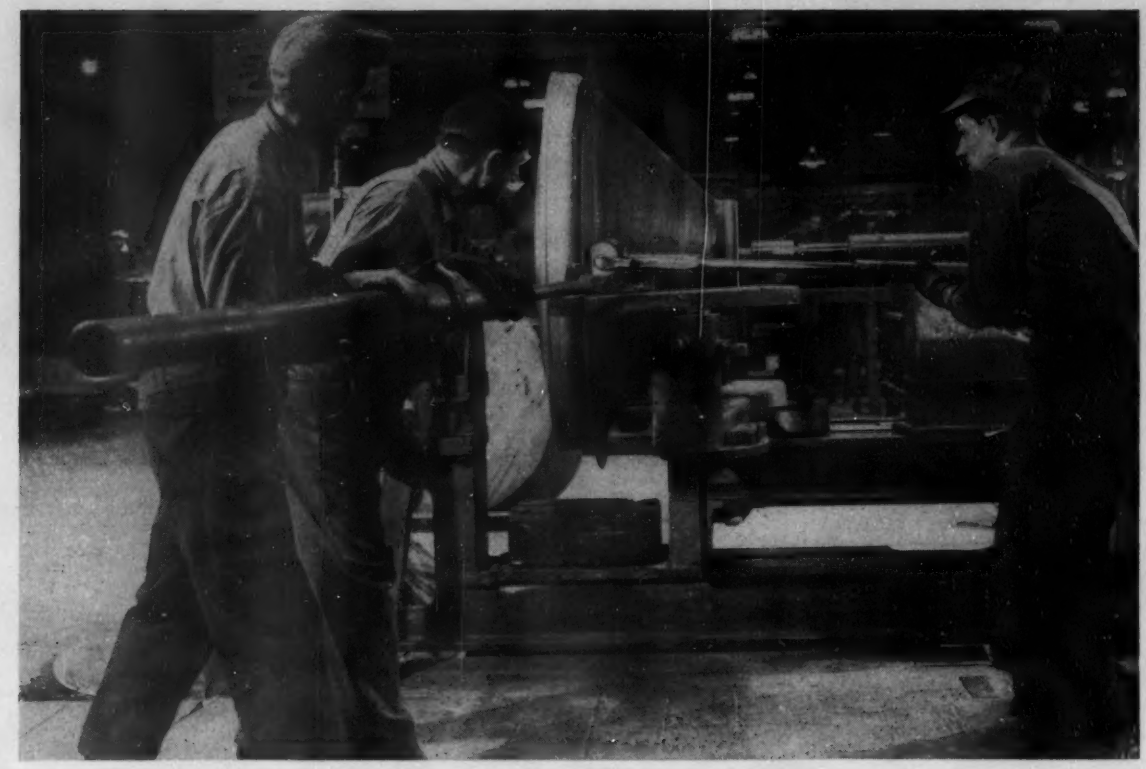
Bending and roll-forming operations are most commonly done with the austenitic and ferritic stainless steels. They are ideally suited for these methods of cold working. These grades require approximately twice the tool capacity needed for mild steel in these operations; the martensitics are not usually formed with these techniques.

While the same methods are used for bending and roll-forming stainless and mild steels, stainless dies and forming rolls should be designed for a spring-back allowance of from two to three times that for mild steel. They should be kept well polished to avoid scratches and marks. Lubricants are often helpful in roll forming and die bending.

By proper design of the forming rolls, extremely sharp corners with small radii are possible. Steady, continuous forming, as in roll forming, is preferable (for the austenitics in particular) to abrupt, step-by-step forming, as on brakes, if complex contours are being developed.

DEEP DRAWING

For deep drawing, all stainless steels require considerably more power and more rugged equipment than plain carbon steels of the same thickness. A speed approximately one-half that used in regular steel drawing will result in flowing stainless to a



SPINNING STAINLESS against a hardwood form to produce a commercial spin dryer

greater depth, and will reduce breakage and excessive scoring of the dies. The clearance between the punch and the draw die should be about twice that used with ordinary steel or brass.

The austenitic stainless steels are well suited for drawing operations. They have a ductility even greater than that of deep-drawing carbon steel. It should be remembered, however, that these chromium-nickel types all work harden rapidly. Slower press speeds are necessary for maximum depth draws, and to achieve uniform work hardening and elongation.

The ferritic and martensitic stainless steels are less ductile than the austenitics. The ferritics can be satisfactorily deep drawn although less severe reductions per step are possible. Ductility may be improved by heating blanks in boiling water prior to drawing. The martensitics, except type 410, are drawn infrequently, and with less severe draws.

Solid dies of high-carbon, high-chromium compositions are best suited for the drawing of stainless-steel sheets and strip; yet for short runs, close-grained cast iron of heat-treatable type is satisfactory. Dies should be smooth and polished at all times to avoid marking the parts. Hard bronze draw rings are desirable to minimize scoring.

Heavy-bodied lubricants with high film strength must be used to maintain a continuous film. The choice of the proper lubricant may be sufficiently

INERT-GAS SHIELDED ARC WELDING is an effective method for attaching fittings to stainless tanks

complex to warrant advice from a qualified lubricant supplier.

SPINNING

By its very nature, spinning is a most severe cold-working operation. However, with lower work-hardening characteristics, the ferritic grades are well suited for these operations. Spinning will work-harden the austenitic stainless steels faster than other forming operations, frequently requiring that the work be re-annealed more often than if the object were formed by drawing. Type 305 is a special spinning grade; it work hardens much more slowly than the more basic types, 302 or 304. Its extra toughness, however, requires extra effort and heavier, more sturdy equipment. Spindle speeds should be reduced to about one-half that for ordinary steels. More frequent process annealing is required with the other 300 series stainless steels and with the 400 series martensitic grades. Spinning is rare with the martensitic grades.

Roller tools generally will be more satisfactory than solid-nose types as less friction (and heat) will be developed. All spun parts should be cleaned completely with nitric acid to remove all trace of foreign metals on the surface before any annealing. If not done, this condition might lessen corrosion resistance.

Joining stainless steels

RIVETING

The chromium-nickel stainless steels may be riveted cold when the rivet diameter is less than 3/16 in. To reduce the effect of hardening under cold work, it is desirable to set rivets up on hydraulic riveters in one blow rather than to do so in a rapid succession of blows. Button heads are recommended for cold work.

On larger sizes, the operation is best performed hot with temperatures controlled accurately. Riveting should be finished above 1600 F to avoid driving within the range of lower ductility; to insure this, it is desirable to conduct the driving between 2050 and 1900 F.

The straight chromium stainless steels, except types 420, 440, 442, and 446 may be driven cold in smaller diameters.

Larger diameters should be hot riveted, but with martensitic types, heating should not exceed 1450 F —otherwise sufficient air hardening may result to snap off the heads of the rivets when cooling.

Maximum temperature for hot riveting the ferritic types must be carefully controlled to avoid increasing grain size and consequent loss of ductility. Type 430 should not be heated above 1500 F. Types 442 and 446 should not be heated above 1600 to 1700 F.

Furnaces with close temperature control are essential, and short-time heating is necessary to prevent excessive scale. Ten minutes for chromium-nickel steels and 25 to 30 min. for the straight chromium steels are suggested.

SOLDERING

All types of stainless steel can be soldered, either with the soft lead-tin or the hard silver solders. It is recommended only as a means of filling or sealing joints, and should not be depended upon for mechanical strength. Joints to be sealed by solder should always be spot welded, riveted, or joined by other mechanical means if strength is required. Welding is preferable where possible.

BRAZING

Since stainless steels can readily be welded by any of a number of processes, brazing is not recommended as a joining technique. While it is possible to produce mechanically tight joints, the brazing alloy may penetrate the crystalline structure of the steel and cause brittleness and reduced ductility. Silver soldering is recommended over brazing if the work cannot be welded.

WELDING

The stainless steels can be welded by all methods applicable to carbon steel except hammer or forge welding. Carbon-arc welding is not recommended. As is the case with all materials, changes affecting their physical or corrosion-resistant properties can occur through heating which occurs in the welding process. Techniques that minimize heating of large areas of the work should be used.

The austenitic grades are most highly recommended for welding. Welds made with the austenitics are naturally tough and ductile and can have the same corrosion resistance as the base metal. If the welded material is to withstand severe corrosive attack, anneal after welding, use a low-carbon modification such as 304L or 316L, or a stabilized type such as 321 or 347.

The ferritic stainless steels are not as weldable as the austenitics. But they can be welded by any commercial method except hammer or forge welding. If properly annealed they are quite tough, ductile, and have good mechanical qualities, although not equal to those of the austenitics. The 18% chromium types such as 430 are most commonly welded.

The hardenable martensitic types can be welded by the special techniques used to weld tool steels and other high-alloy steels. They require pre-heating, post-heating, or both—and a full anneal of the finished weldment is desirable. The lower chromium types, such as 410 with 12% chromium, can be softened satisfactorily by annealing.

In the design of welded joints, buttwelds, single or double, are preferred to equalize stresses. Buttwelds are more satisfactory than corner or flange and lap welds. Complete penetration is always desirable, espeically if the structure is to be subject to shock. Annealing, as mentioned, is always recommended wherever possible. It is essential with the martensitic grades.

Heat treating and annealing

AUSTENITIC STAINLESS STEELS

None of the austenitic stainless steels is normally hardenable by heat-treatment. High strength is obtained by cold working this group. Type 301 with its lower nickel-chromium ratio is particularly suited to work hardening to high mechanical properties.

Normally, however, the austenitic stainless steels are used in the annealed condition. The metal then has the greatest resistance to corrosion, and is also very ductile and hence best suited for bending, forming, and deep drawing. Most austenitic stainless is supplied by the primary producer already annealed. If in fabrication the material is cold worked to an undesirable extent, the piece can be annealed by heating to 1950 to 2050 F, followed by rapid cooling.

Caution: Remove the lubricating compound before heat-treatment; if it remains on the surface it may cause serious etching attack on the metal, or carburization and subsequent potential reduction of corrosion resistance.

FERRITIC STAINLESS STEELS

Ferritic stainless steels require moderate temperatures only for process annealing and stress relieving. Treatment of the medium-chromium ferritic stainless steels differs somewhat from that of the higher-chromium steels.

For type 430, with 14 to 18% chromium, and for other ferritic stainless steels of the medium-chromium type, maximum ductility is obtained by holding at 1400 to 1500 F until the metal is heated through, followed by rapid cooling. This, of course, requires that the whole piece be annealed. When this is not possible or practical, heating the work to a dull cherry red with a blowtorch, followed by rapid cooling in air, will usually be satisfactory.

For type 446, with 23 to 27% chromium, heat the piece through at 1450 to 1600 F—then cool rapidly. Quenching is desirable.

Heat-Treating and Annealing

	Hardening	Full Anneal	Process Anneal
Austenitics			
Unstabilized	Hardenable only through cold working	1850 to 2100 F quick cool	1800 to 2050 F quick cool
Stabilized	Hardenable only through cold working	1850 to 2050 F air cool	1550 to 1650 F air cool
Ferritics	Non-hardenable	1450 to 1550 F air cool	1200 to 1525 F air cool
Martensitics	1750 to 1950 F oil or air quench	1500 to 1650 F slow cool	1300 to 1400 F air cool

MARTENSITIC STAINLESS STEELS

The martensitic stainless steels can be heat-treated to high strength and toughness. For the highest mechanical properties, the piece should be heated to 1800 to 1850 F and quenched in oil. Because of the low thermal conductivity, it should be heated slowly and carefully to the proper temperature. Where oil quenching may cause cracking because of intricate or complicated design, air cooling may be used. Hardening must always be followed by stress relieving or tempering at 400 F or higher, depending on the desired properties.

In working the martensitic stainless steels, some method of relieving stresses and increasing the ductility and toughness may be desired. The work should be annealed in a muffle-type furnace, as direct contact with a flame for any length of time is undesirable. Heat the piece uniformly and slowly to 1400 to 1500 F and soak thoroughly. Furnace cooling to 1100 F is recommended. If air-cooled, do not heat the piece above 1400 F.

FINISHING

Requirements for finish on the stainless steels vary widely. The following sheet surface finishes can be supplied by the primary producer. However, the appearance of a particular type of finish may vary somewhat with the different types of stainless steel owing to the different inherent characteristics of the materials.

No. 1 Finish, hot rolled, annealed, and pickled—This is rarely used as a basic raw material for sub-

CARBIDE BURS clean corner welds before brushing and final buffing

FINAL BUFFING of a stainless food container with flexible-shaft wheel

sequent polishing or buffing, except in cases where forming and annealing would destroy higher mill finishes. It is furnished chiefly in heavier gages for industrial applications.

No. 2D Finish, dull cold rolled—Sheets are cold rolled before final annealing and pickling, and, as a result, have a much better finish than No. 1. Sheets with this finish have a compact, dense surface, and maximum ductility and drawing quality. This finish is considered by many to be most suitable for severe drawing operations. It is specified for most products that are to be buffed or polished after severe forming operations where no annealing will be involved.

No. 2B Finish, bright cold rolled—This finish is produced by a final light cold rolling. It has a bright, dense surface of slightly harder temper than No. 2D. It is considered by some to be less suitable for extremely deep draws than a No. 2D finish. However, for less severe forming operations such as shallow draws, it offers a better surface on which to begin polishing operations.

No. 4 Finish, standard polish on one or both sides—The sheet surface is ground with successively finer abrasives, producing a uniform, bright finish with good luster. It is suitable for shallow draws or moderate forming operations where the original finish will not be destroyed or require refinishing.

No. 6 Finish, Tampico-brushed finish—It has a dull matte appearance with a uniform, delicate, velvety texture. This satin finish is the result of both polishing and subsequent brushing.

No. 7 Finish, high luster polish—This is a polished semi-mirror finish, more brilliant than No. 4.

All stainless steels have relatively smooth, dense surfaces, making finishing operations easy and economical. Type 430, for example, which currently is being used widely for automotive trim applications, usually requires only a small amount of buffing after being roll-formed.

All the stainless steels should be protected during fabrication. Plastic coatings, which can later be peeled off or removed by solvents, or even paper glued to the metal, provide protection when handling or laying out the work. Paper or felt under hold-down pads, adhesive tape on the edges of brakes, and ample lubricant when drawing will reduce surface marking.

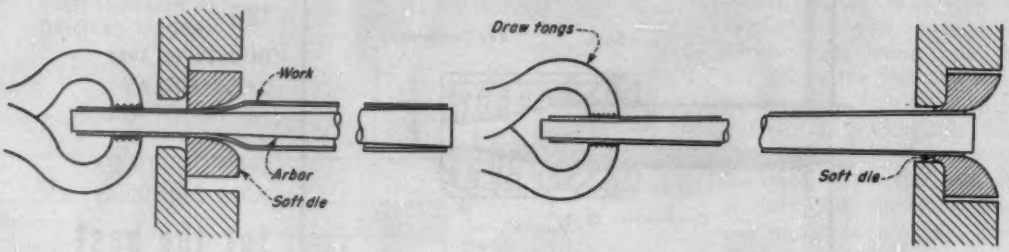
Grinding, polishing, and buffing stainless steel present problems different from those encountered in handling other steels and non-ferrous metals. Stainless conducts heat away more slowly than other steels, so special precautions should be taken against overheating.

Never use wheels or buffs that are contaminated with other metals. These metals may become imbedded in the surface of the stainless, causing stains or streaks.

Do not use buffing or greasing compounds containing iron oxide. Specify iron-free or iron-oxide-free compounds for buffing stainless steels. Many special buffing compounds are available commercially.

Stainless is also finished in many other ways, including: darkened oxide finishes; electroplating, electrolytic polishing, painting. But, generally speaking, for maximum corrosion resistance, it's best not to add any coating to stainless.

Practical Ideas . . .



Soft Die and Hard Arbor Taper Tubes

During the war we were handed a rush order for a few pieces of tapered seamless copper tube, 7 ft. long, tapering from 0.87 in. to 1.25 in. The wall thickness of the work was 0.050 in.

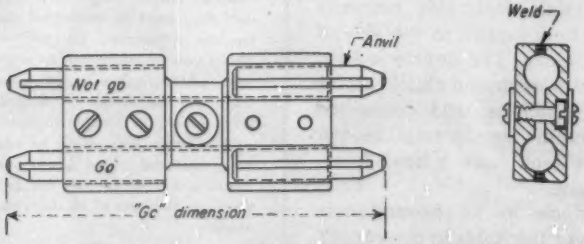
Because this was a rush job, and we didn't have any special equipment for the work, we improvised with the setup shown, and got the work finished quickly and more easily than we had hoped when we first saw the order.

First we made a tapered steel arbor, turned to the shape of the required ID of the finished parts. The arbor was so long that we made it in sections, attaching them by leaving a turned threaded stud on one end, and drilling and tapping the other end of each section. We left a short straight length on the narrow end of the arbor, for gripping.

We then made dies of an alloy of lead and antimony, with holes equal to the smallest OD of the tubing. To taper the tubing, we slipped it over the arbor, put the small end through the die, and pulled the tube and arbor through the die. Tapering was done on a conventional draw-board, and the dies was backed up by the conventional kind of die support.

As the drawing of each tube proceeded, the tube was compressed to size, and the pressure of the arbor made the die expand outwardly. Each tube required a new die, of course, but the dies were easily cast in a cheap mold at low heat, so this wasn't serious.

To enter the die, the beginning of each tube had to be swaged to the 0.087-in. OD, so it would fit through the die cavity. Before being drawn, the tubes were reduced to the low limit of the OD of the large end of the taper, and annealed. *F E Chase, Pawtucket, R I*

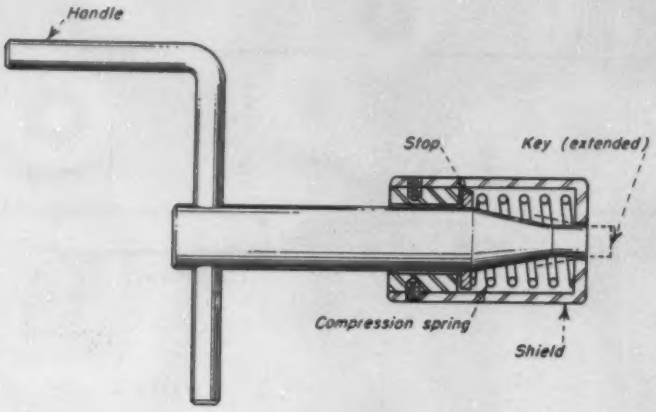


Adjustable Go-No Go ID Gages

Where there is no certainty of the same or similar orders going through the shop—for example in a small-lot job shop, it is uneconomical to make a permanent gage for each dimension that is being machined. The adjustable gage shown here is a good solution to this problem.

As can be seen from the drawing, the gage is composed of four slotted pins which are fastened in place in a holder with the setscrews. It is a good idea to provide a special wrench for changing the anvils. This will discourage unauthorized people from tampering with the adjustment of the gage. Aluminum disks are engraved with the part number and the tolerances to which the gage is set. *A G Amos, Jamshedpur, India*

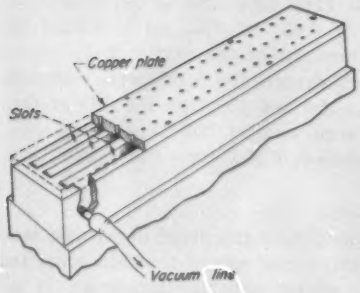
IN PRACTICAL IDEAS, AM — Aug 2, '54, p137, the contribution, "Fixture Sharpens Milling Cutters on Lathes" was marked "Contributor Unknown." We have since learned that the idea was submitted by R J Geiser, Lima, Ohio, and we are happy to (belatedly) acknowledge the author's name and address.



Self Ejecting Chuck Wrench

Danger of a machine operator leaving a chuck-wrench in the lathe chuck when starting his machine has been eliminated by the device shown here, which makes it impossible for the operator to have such an accident.

Downward pressure on the handle pushes the wrench through the collar, and into the socket of the chuck. As the pressure is released, the wrench is automatically ejected from the socket. *Herbert F Ross, Superintendent of Central Shops, Argonne National Laboratory, Lemont, Ill*



"Vacuum" Chuck Holds Thin Strip for Grinding

The chuck shown here was our answer to the problem of grinding very thin strips of tool steel after heat-treating. We had had trouble because, when grinding this kind of work, the work was so thin that the stock heated up, expanded, and bowed away from the magnetic chuck of the machine. Result was thin spots in the work.

To reduce the heating, and permit these strips to be ground flat, we made up a small "vacuum" chuck. It consisted of a steel plate, with a bar of hard copper fastened to the top face of the steel block. The copper was drilled through as shown. Three narrow slots spaced to match the holes in the copper were milled in the top of the steel block. (These slots did not break through the ends of the block.) A hole through each slot connects with the hole tapped in the side of the steel block. The device is then held on the magnetic chuck of the grinding machine, and connected to the suction side of a small blower which we took from a heat-treating furnace.

The stock to be ground was placed over the holes in the copper. When short pieces were ground, the unused holes were covered with plastic adhesive tape. The copper conducted the heat away from the work. A large number of holes in the chuck gave a more uniform grip than the widely spaced poles of the magnetic chuck. *Robert Weidenhoft, Brooklyn, N Y*

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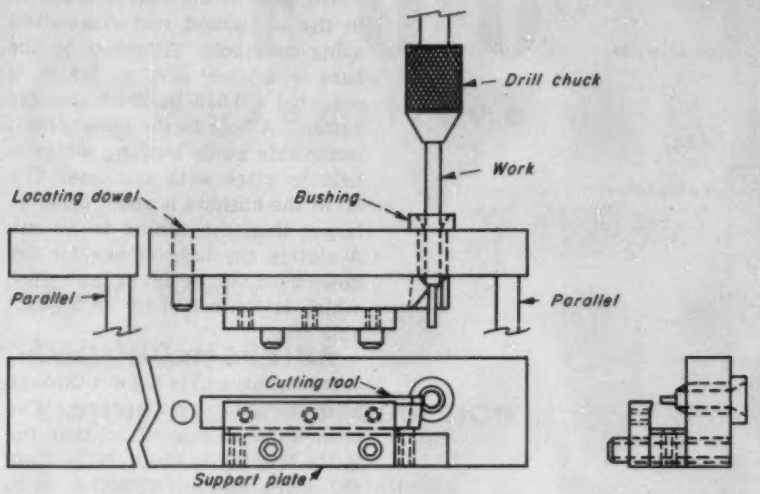


Drillpress Turns Small Stock

Shown here is a tool we use for turning very small punches from ground rod. In turning long, small diameters in a lathe, it is often hard to get a true, uniform diameter.

Instead of using a lathe, we cut the parts to length, and grip them in the chuck of a drillpress. A cutting tool is placed on parallels, as shown. Holding the left end of the fixture in the left hand, the work is advanced into the hardened bushing and fed to the toolbit by the right hand, as in conventional drilling.

The toolbit is supported by a plate and rest which are screwed to a handle. Two setscrews are adjusted to bring the tool to the centerline of the work.

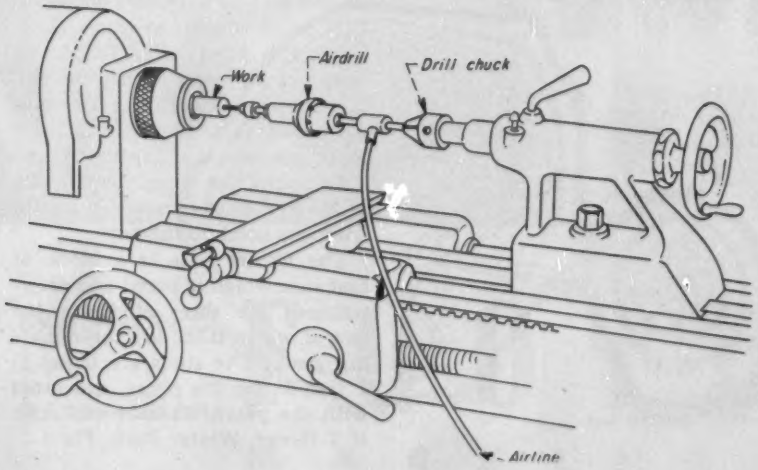
Setscrews clamp the toolbit against the handle. A dowel pin provides a reference point for locating the tool for turning different diameters, with gage blocks or feeler gages being used between the end of the tool and the side of the dowel.

The hole in the guide bushing is radiused to provide easy entry of the stock, and is the same diameter as the OD of the stock. The other end of the bushing has a concave radius to match the radius on the tool. This way the stock is supported right to the edge of the cutting tool, and does not have a chance to spring away.

Bushings of various sizes are made for different stock. While we have found the locating-pin method satisfactory for setting the tool, a micrometer-screw arrangement could be used for this purpose. Also, a more elaborate method could be made to advance or retract the tool to clear the work being withdrawn.

Another variation of this tool could be made for cutting off stock, using either a slideable tool or two hinged sections—one containing the bushing, the other holding the tool. *Clarence B Winch, Tonawanda, N Y*

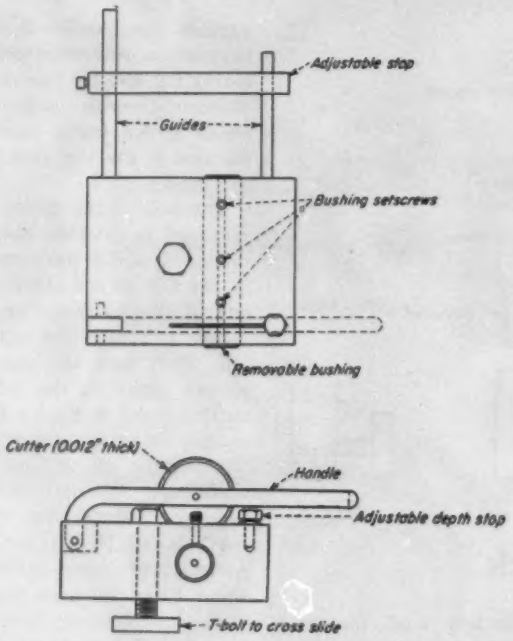
Air Motor In Tailstock Adds to Small-Drill Speed



An air motor mounted as shown here in the tailstock or turret of a lathe adds speed to a small drill when drilling work held in the chuck of a lathe.

With this method, breakage of small drills is avoided, especially on deep holes. Also drilling time can be cut because of the increased speed of the drill.

A standard drill chuck is held in the tail stock of the lathe. An air drill is held in the drill chuck and the drill is mounted in the chuck of the air motor. *John T Zurlo, Champlain, N Y*



Bench Lathe Fixture Speeds Capillary Tube Cutoff

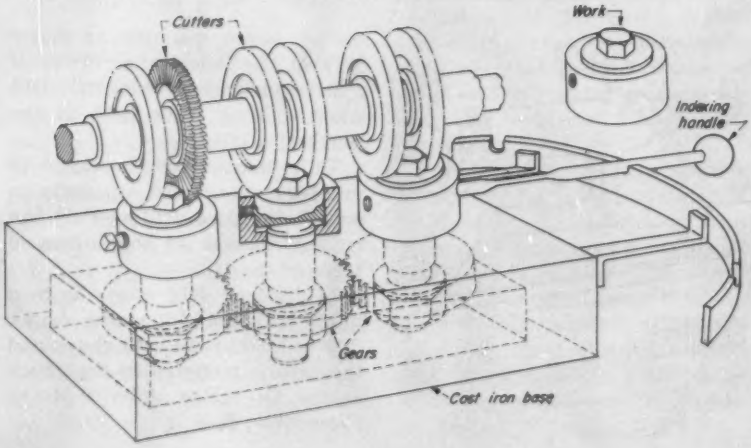
We had a quality control and production problem when cutting off lengths of copper capillary tubing. We wanted to speed the job and avoid deburring the ends of the tube. To do this, we built a fixture which was to be used with a bench lathe.

The base of the fixture is bolted to the compound rest cross-slide, using a T-bolt. Attached to the base is a lever arm on which is mounted a 0.012-in.-thick circular cutter. A hole in the base holds a removable guide bushing which is held in place with setcrews. The ID of the bushing is about 0.005 in. larger than the tubing to be cut. A slot in the base allows for the downward movement of the cutter, which is controlled by an adjustable stop.

The capillary tubing is cut into 3-ft lengths, and is fed out through a collet into the bushing. The cross-slide is aligned so that the guide bushing is about ¾ in. from the collet. The tubing is fed out to the guide, which has been set to the length desired, measuring from the slot in the base.

The collet is closed, and the lathe started. With the adjustable stop set so the cutter cuts only about half the thickness of the tube, the cutter is brought down against the tube. Then the tubing is fed out until the nicked part protrudes beyond the base, and, with a slight back and forth motion, the partly severed workpiece is broken from the stock. *George S Norko, Milford, Conn*

Gang-Cutters Speed Plug Hexing



We had to put a short hex section on one end of a large number of steel plugs which had been cut off from cold-rolled bars. To do this work quickly, we designed the fixture shown. Six milling cutters are positioned on an arbor, and three plugs are mounted in the fixture.

To index the plugs the handle at the end of the fixture is moved from one notch to the next.

The fixture base is a block of cast iron which is bored and counterbored for three studs on the end of which there are three mating gears. The studs are bored to a free fit for the plugs, and fitted with the gears, washers and nuts. *H T Green, Winter Park, Fla*

FOOTBURT

sensitive drilling machines

A FULL RANGE
DRILLING MACHINE
ENGINEERED FOR PRODUCTION

Built carefully to provide the required accuracy for fine tool room work, Footburt Sensitives are designed with the weight and stability to maintain close tolerances on day after day production work. The correct speed for a wide range of drilling, reaming, and counterboring operations is instantly available. Write for full information on this great line of Sensitive Drilling Machines. Built in 1, 2, 3, 4, 6 Spindle Models.

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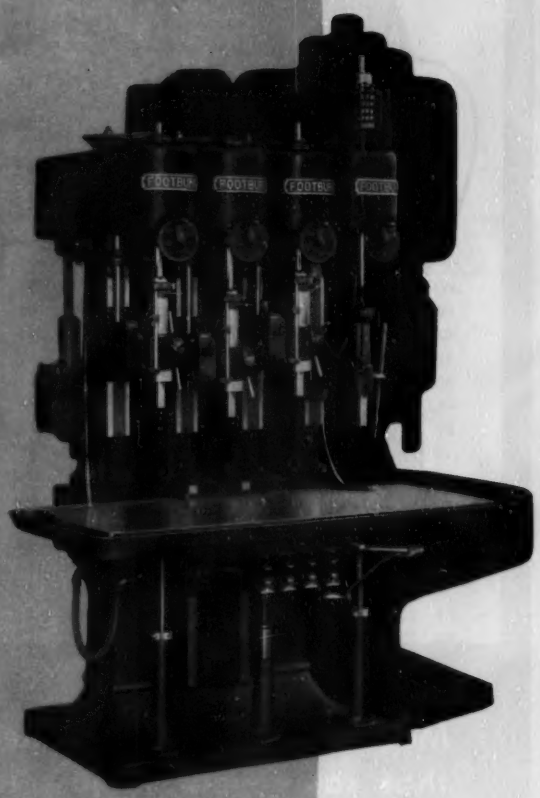
Cleveland 8, Ohio
Detroit Office: General Motors Building



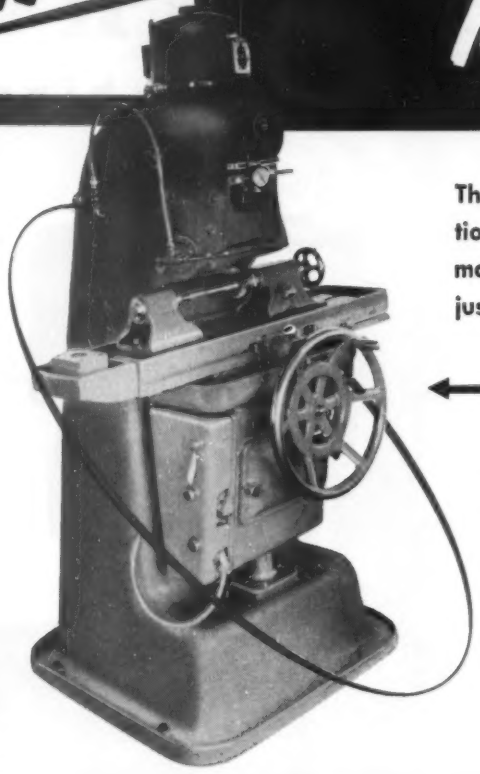
No. 2 Machine with Back Gear • 12" Overhang • 5/8" Drilling Capacity in Steel • Optional Speed Ranges • 185 to 2300 RPM • 280 to 3450 RPM • Vertical Motor Drive with Standard Single Speed Motor • Power Feed Assembly • Tapping Attachment • Coolant Outfit.

engineered for production

FOOTBURT

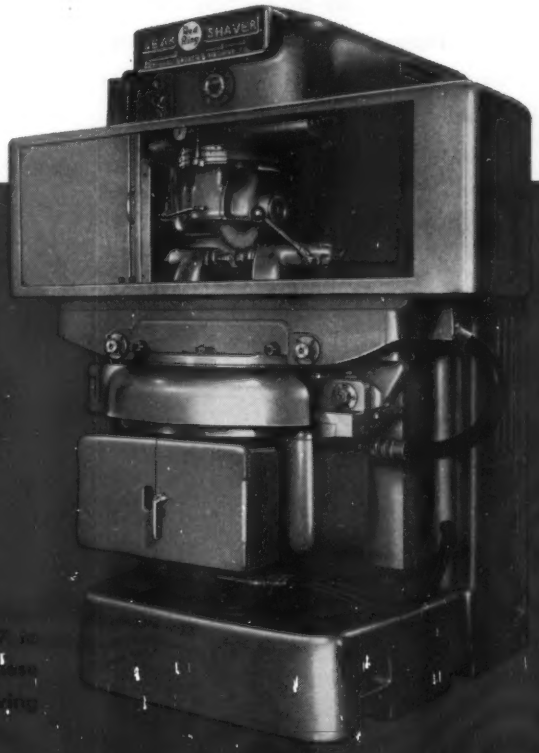
MACHINE TOOLS

NOW IS THE TIME TO Cut Manufacturing Costs



The one sure way of meeting today's competition is with today's machine tools. The older machines were all right in their day but they just haven't got what it takes now.

← **For instance,** it took this old Red Ring Model GCC 60 seconds to shave a gear like the one shown. →



Model GCU today finishes that same gear in just 16 seconds—and to much closer tolerances, too.

In an 8 hour day the GCU will deliver 375% of the production of its predecessor.

Write for Bulletin S-53c7 to get all the facts on these new cost saving gear shaving machines.

NATIONAL BROACH & MACHINE CO.

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WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

Normal Thread Angles and Bottom Flats (Acme) . . . I

DONALD SWEET

Normal thread angle is the angle on the cutter blade that produces the sloped side of the thread. As the cutter works, it is aligned at the helix angle, twisted from the plane perpendicular to the thread centerline, so the normal thread angle is even less than the nominal 29° of the Acme thread.

The following tables give the normal thread angle to the nearest minute for helix angles from 0° to about 22°. In addition, the width of cutter at the tip, where the thread bottom is cut, is given for Acme threads from 4 to 16 tpi, including helix angles from 0° to about 24°.

ANGLES

Consider a 1-in. Acme thread, 0.2-in. pitch, 0.8-in. lead, 3G fit: Pitch dia would be (E), $\frac{0.8940}{0.8849}$ in., and minor dia would be $\frac{0.7800}{0.7664}$ in.

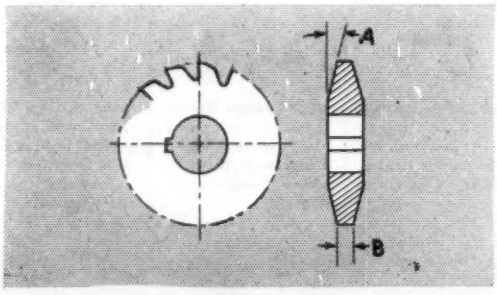
Tan ½ normal thread angle
= Tan 14°30′ (half 29°) x cos helix angle
= 0.2586176 x 0.95905
= 0.24801

½ normal thd angle
= 13°56′15″

From the table, this angle would be read 13°56′, within a minute of the exact figure.

ANGLES . . . A

Helix Angle From ... to ...				Normal Thread Angle, A		Helix Angle From ... to ...				Normal Thread Angle, A	
Deg	Min	Deg	Min	Deg	Min	Deg	Min	Deg	Min	Deg	Min
0	00	1	25	14	30	15	16	15	32	14	00
1	25	2	24	14	29	15	32	15	47	13	59
2	24	4	24	14	28	15	47	16	02	13	58
4	24	5	14	14	27	16	02	16	17	13	57
5	14	5	58	14	26	16	17	16	31	13	56
5	58	6	35	14	25	16	31	16	46	13	55
6	35	7	10	14	24	16	46	17	00	13	54
7	10	7	42	14	23	17	00	17	14	13	53
7	42	8	12	14	22	17	14	17	28	13	52
8	12	8	40	14	21	17	28	17	41	13	51
8	40	9	06	14	20	17	41	17	54	13	50
9	06	9	32	14	19	17	54	18	08	13	49
9	32	9	56	14	18	18	08	18	22	13	48
9	56	10	20	14	17	18	22	18	34	13	47
10	20	10	42	14	16	18	34	18	47	13	46
10	42	11	04	14	15	18	47	19	00	13	45
11	04	11	24	14	14	19	00	19	12	13	44
11	24	11	45	14	13	19	12	19	24	13	43
11	45	12	05	14	12	19	24	19	37	13	42
12	05	12	25	14	11	19	37	19	49	13	41
12	25	12	44	14	10	19	49	20	01	13	40
12	44	13	02	14	09	20	01	20	13	13	39
13	02	13	20	14	08	20	13	20	24	13	38
13	20	13	38	14	07	20	24	20	36	13	37
13	38	13	55	14	06	20	36	20	47	13	36
13	55	14	12	14	05	20	47	21	00	13	35
14	12	14	28	14	04	21	00	21	11	13	34
14	28	14	44	14	03	21	11	21	22	13	33
14	44	15	01	14	02	21	22	21	33	13	32
15	01	15	16	14	01	21	33	21	44	13	31



VLIER Ready-Made Spring Plungers

Eliminate Costly, Custom-Made Devices!

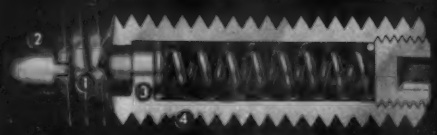
Provide accurate, pre-set end pressures for every need!

Why waste toolmaker's time machining make-shift devices to provide necessary spring loads? Standardizing on low-cost, ready-made Vlier Spring Plungers speeds jig and fixture manufacture and insures *accurate, uniform* loading, resulting in more accurate machining, fewer rejected parts!

40 TYPES AND SIZES! Hundreds of thousands of Vlier Spring Plungers are now in use positioning parts in dies, jigs, and fixtures, as detents, locating pins, and die ejectors... wherever accurately-controlled, constant spring pressure is needed! *Order a wide assortment of types and sizes from your Vlier distributor today!*

❶ **Plunger end telescopes completely within body!** End pressure is determined with plunger end telescoped 50%.

❷ **Case-hardened plunger end gives high wear resistance!** Ductile core overcomes brittleness, reduces hazard of failure under impact common with hardened, high-carbon steel.

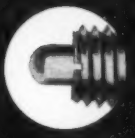


❸ **Large bearing surface** assures perfect alignment at any part of plunger travel; eliminates binding and reduces wear!

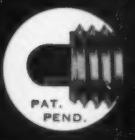
❹ **Rust-proof finish** prevents freezing in the fixture!

4 New Types Available!

Standard Nose—Cylindrical plunger end is accurately radiused to speed loading and unloading of jig or fixture. End pressures available from 3# to 42#; various diameters and lengths.



Silvernose—Cadmium-plated plunger ends identify light (1# to 7#) end pressures. Special spring design developed for fast, repetitive operations, give millions of flexes without fatigue failure!



Hexnose—Plunger end is hexagonal-shaped. Can be easily and quickly installed, adjusted, or removed with an ordinary end wrench! End pressures available from 8# to 12# in Standard type, and from 2½# to 6# in Silvernose type; various diameters and lengths.

Plastic Nose—For use with aluminum, brass, and other soft, easily marred materials. Plastic plunger end reinforced for less deformation under loading. Excellent wear resistance; high dielectric strength. End pressures available from 5# to 18# in Standard type, and 1½# to 7# in Silvernose type; various diameters and lengths.

VLIER ENGINEERING

TORQUE THUMB SCREWS • SPRING PLUNGERS • SPRING STOPS • FIXTURE KEYS • TOGGLE PADS • KEY KLIPS

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Vlier Screw-ball Clamps — Overcome angular irregularities in clamping set-ups. Prevent surface damage. 17 sizes!

Vlier Key Klips—Eliminate lost hex keys! Speed positioning of part in fixture. 3 sizes!

Vlier Torque Thumb Screws—Apply accurate, controlled end pressures to the workpiece. 4 models; 19 sizes!

Vlier Spring Stops—For use where there are no wall sections in fixture. Two models: 14 and 32 lbs. end pressure.

Vlier Toggle Pads—Assure clamping of parts with irregular surfaces. 5 sizes: for use with standard screws, toggle clamps and pliers.

Vlier Fixture Keys—New 5-Way Key fits all common mill table slots. 3-Way model also available.

Write for your complete catalog of VLIER PRODUCTS today! It's free!

Normal Thread Angles and Bottom Flats (Acme) . . . II

FLATS

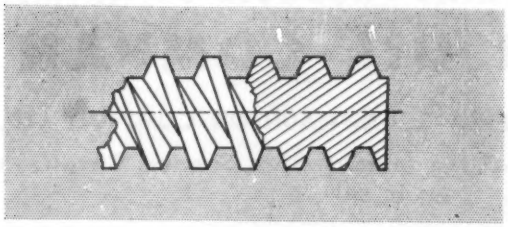
For the same 1-in. thread, the flat would be:

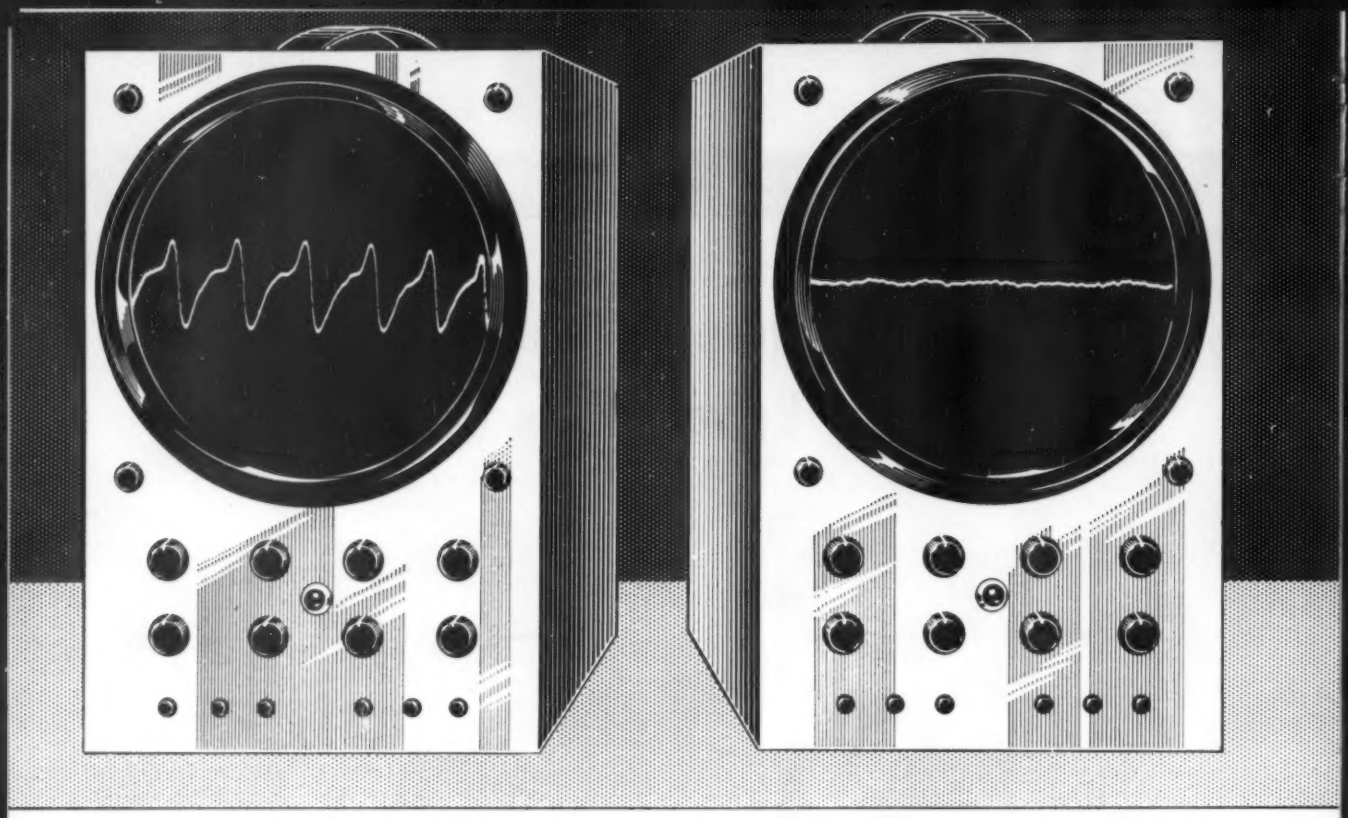
$X = 0.100 - 2(0.2586176 \times 0.057)$
$= 0.0705$ in.

From the table, the flat would read 0.0660 in., which is less than maximum normal flat to allow for cutter wear. Flat dimensions in the table go in increments of 0.0005 in., but can in no cases fall outside the limit of the root dia.

FLATS . . . B

Helix Angle From Deg	Min	to Deg	Min	Normal Bottom Flat, (in.) B	T p i
0	0	9	45	0.0205	16
9	45	16	20	0.0200	16
16	20	20	46	0.0195	16
20	46	24	43	0.0190	16
0	0	8	28	0.0240	14
8	28	14	29	0.0235	14
14	29	18	29	0.0230	14
18	29	21	57	0.0225	14
21	57	23	51	0.0220	14
0	0	5	23	0.0283	12
5	23	13	02	0.0278	12
13	02	17	00	0.0273	12
17	00	20	12	0.0268	12
20	12	22	58	0.0263	12
0	0	5	23	0.0320	10
5	23	12	15	0.0315	10
12	15	15	59	0.0310	10
15	59	18	59	0.0305	10
18	59	21	35	0.0300	10
21	35	23	54	0.0295	10
0	0	4	28	0.0410	8
4	28	10	49	0.0405	8
10	49	14	07	0.0400	8
14	07	17	45	0.0495	8
17	45	19	02	0.0390	8
19	02	21	05	0.0385	8
21	05	22	57	0.0380	8
0	0	3	49	0.0565	6
3	49	9	13	0.0560	6
9	13	12	01	0.0555	6
12	01	14	15	0.0550	6
14	15	16	11	0.0545	6
16	11	17	55	0.0540	6
17	55	19	30	0.0535	6
19	30	20	58	0.0530	6
20	58	22	21	0.0525	6
0	0	3	27	0.0690	5
3	27	8	20	0.0685	5
8	20	10	54	0.0680	5
10	54	12	54	0.0675	5
12	54	14	39	0.0670	5
14	39	16	12	0.0665	5
16	12	17	38	0.0660	5
17	38	18	58	0.0655	5
18	58	20	12	0.0650	5
20	12	21	22	0.0645	5
0	0	3	04	0.0875	4
3	04	7	24	0.0870	4
7	24	9	38	0.0865	4
9	38	11	26	0.0860	4
11	26	13	00	0.0855	4
13	00	14	23	0.0850	4
14	23	15	39	0.0845	4
15	39	16	49	0.0840	4
16	49	17	55	0.0835	4
17	55	18	57	0.0830	4
18	57	19	56	0.0825	4
19	56	20	52	0.0820	4
20	52	21	46	0.0815	4
21	46	22	38	0.0810	4





WHEN A STRAIGHT MINERAL OIL was used to lubricate the ways, an 0.0008" jump at frequency of 2.74 cycles per second was noted.

WHEN SUNOCO WAY LUBRICANT was used on the ways, the jump was too small to measure, proof that this medium stops slip-stick motion.

TEST PROVES SUNOCO WAY LUBRICANT ENDS SLIP-STICK TABLE MOTION

How effectively Sunoco Way Lubricant stops slip-stick table motion is graphically illustrated by these oscillograms. The pattern on the left was made with a straight mineral oil as the lubricant; the other was made with Sunoco Way Lubricant on the ways. Both patterns are magnifications of changes in rate of table travel and were obtained under identical conditions.

You can stop slip-stick table motion, protect the ways, get better surface finishes, cut production losses with Sunoco Way Lubricant. Try it in your shop. For more information, call your nearest Sun office or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. AM-9.

INDUSTRIAL PRODUCTS DEPARTMENT

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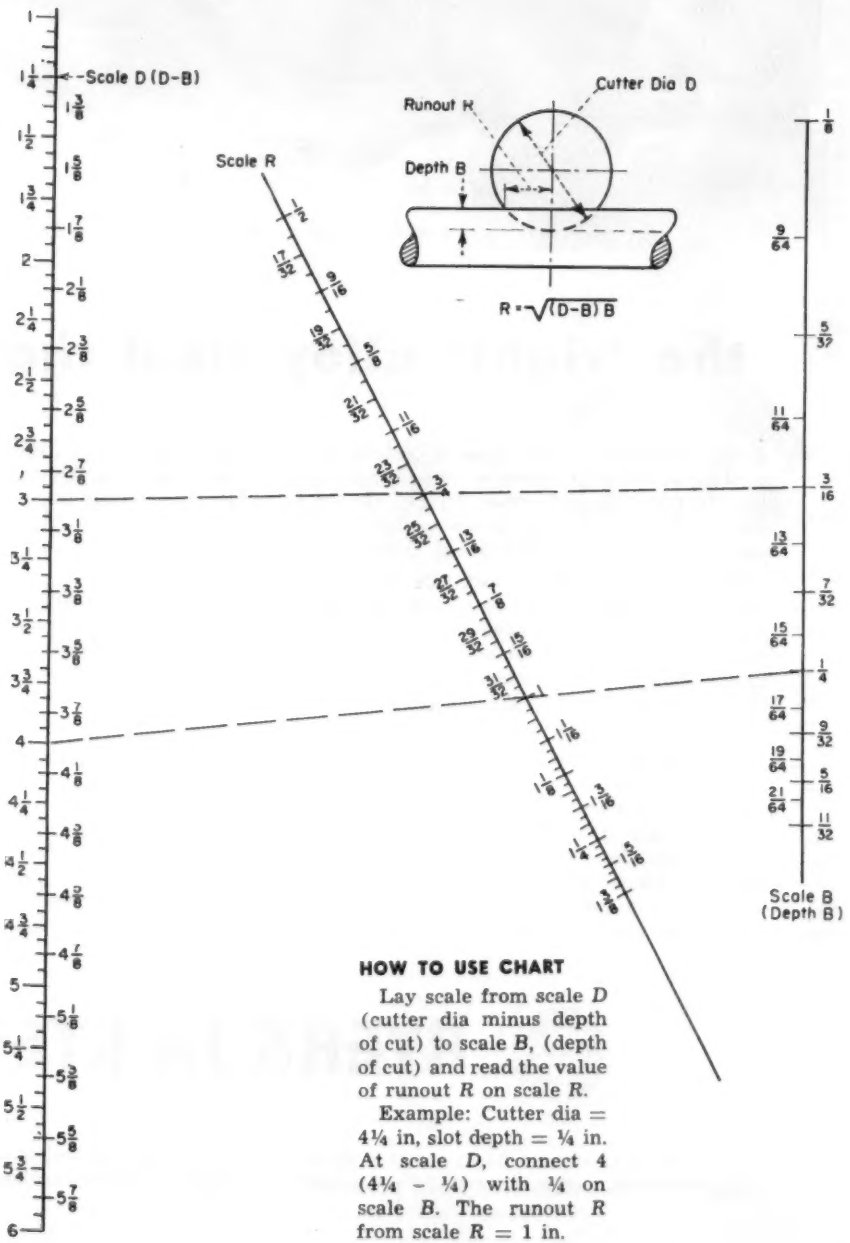
Refiners of the famous Blue Sunoco Gasoline and Dynalube Motor Oils

Slotting-Cutter Runout

DONALD E SWEET, tool engineer



HOW TO USE CHART

Lay scale from scale *D* (cutter dia minus depth of cut) to scale *B*, (depth of cut) and read the value of runout *R* on scale *R*.

Example: Cutter dia = 4¼ in, slot depth = ¼ in. At scale *D*, connect 4 (4¼ – ¼) with ¼ on scale *B*. The runout *R* from scale *R* = 1 in.

the "right" alloy steel that failed

A manufacturer wisely chose a certain alloy steel for key strength parts to avoid breakdown and the possibility of human injury. He specified an alloy that should have been right for the job. Yet, the "right" alloy failed. Why?

Since one alloy looks just like another, it might have been a case of mixed steels or it might have been poor response to heat treatment because of the variations that occur between different heats within the same specification. But here at Ryerson we have a plan to protect you from these hazards.

To avoid danger from mixed steels and to tell you exactly what to expect from heat treatment, Ryerson—and only Ryerson—puts every heat of alloy steel through 8 quality-control steps. Every heat is carefully selected, its anlysis verified and its hardenability established by a series of end-quench tests. Every bar is spark tested, positively identified with its own heat symbol and separately racked with other bars from the same heat. And finally, every shipment is carefully inspected and accompanied by a Ryerson Alloy Certificate which includes all test data to confirm analysis and guide heat treatment.

All this extra quality protection is provided by Ryerson at no extra cost to you. So to be sure of your alloy steel—sure of type and quality, sure of what the steel will safely do—call Ryerson for *Certified* Alloy Steel.

PRINCIPAL PRODUCTS

CARBON STEEL BARS—Hot rolled & cold finished
ALLOYS—Hot rolled, cold finished, heat treated
STAINLESS—Allegheny bars, plates, sheets, tubes, etc.
TUBING—Seamless & welded, mechanical & boiler tubes
STRUCTURALS — Channels, angles, beams, etc.
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RYERSON STEEL

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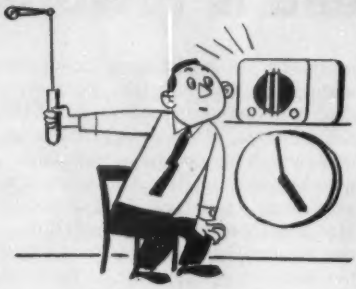
DETROIT • PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

Talking Shop . . .



When the Whistle Blows

LANDIS TOOL CO, Waynesboro, Penna, controls all plants clocks by a central master, as many plants do. But an added wrinkle is a radio above the clock, tuned to the Arlington time signal, so the clock can be set exactly. Thus, Waynesboro residents can set *their* clocks by the Landis whistle.

New Philosophy

DEL S HARDER, vp-mfg, Ford Motor Co, identified automation as a "new philosophy of manufacturing" at the Quad-City Conference on Automation in Davenport, Ia, Aug 27. He now believes that design of parts to be produced, methods for their manufacture, and tool-control systems should be a part of a broader definition of automation, originally defined by Ford as "the automatic handling of parts between progressive production processes." He cited three advantages of Ford adoption of automation: lower production costs, less-monotonous jobs, and built-in inspection and automatic handling assuring better-quality undamaged parts.

Secret

THE SECRET of American prosperity, according to a recent statement by Wm E Rappard, Swiss economist, is a four-step thing: mass markets, scientific research, passion for productivity, and spirit of competition.

6 To 1

SIDE CUTTING-EDGE ANGLE of 3°, 15° end cutting edge, 0 back rake and 6° side rake, plus 6° relief and 10° clearance, with 1/32-in. nose radius, on a new Carboloy 350 tool, increased lathe- tool life 6 to 1 for Menasco Mfg Co, Burbank, Calif, on heat-treated landing-gear struts. Hardness was about R_c46, and at 170 sfpm, production was only 1 p/grind. Now speed is 227 sfpm. The cut is 3⅞ OD by 36 in. long through forging scale. Cuts varied from 0.060 to 0.200 in. on roughing, finish 0.060 in. deep. Feed was 0.010 ipr. Coolant is water-soluble oil, on a Monarch 25-in. lathe with air tracer. Chipbreaker was 0.060 in. wide by 0.015 in. deep.

Maintenance Checker

PORTABLE TOOLS are tested after repair at Convair-Fort Worth with a new device developed by a foreman and a maintenance man, thus ending frequent squabbles over whether a repaired tool is in best working order. The gadget measures no-load and load rpm, air consumption, line pressure, and the like. It can be, and is, used also for testing new tools. Next project: a similar gadget for impact-tool testing.

Solution Ceramics

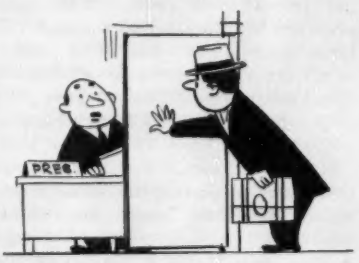
DIFFERING from porcelain enamel in that they are not brittle and can be applied to a clean, solid surface at a few hundred degrees F, new flexible ceramic coatings have been developed by Ill Tech, Chicago. They are called "solution ceramics" because they are applied from chemical solutions and contain no adhesive or binding agent. Films as thick as 0.01 in., or a few millionths thick, can be applied without expensive equipment or protected heating. They can be scratched by knife blade, hence are soft enough to permit stamping after application, yet will withstand high heats — even molten metal or slag. Other coatings can be anchored to them and they resist chemical attack. For details, address E W Wickert, asst business mgr, Armour Research Fdtn, Ill Institute of Technology, Chicago 16.

Putty Is Abrasive

NOZZLES on putty guns, used by sash and door manufacturers for applying putty under air pressure, wear out after 50 hr or so of use. Latest idea is to substitute K-6 Kennametal, which in the first year has operated 2080 hr without apparent wear. Steel nozzles cost $3 to $10, the carbide $30 for the tip, which is brazed on a used steel body. Thus cost has been cut 4/5 already, and the new nozzles are expected to last a couple of years more.

Diesels in Britain

BRITAIN'S DIESEL INDUSTRY, in contrast to ours, is currently busy with orders. Expanded considerably since WW II, it is making locomotives for railways, factories, ports, quarries, and other industrial users. Large locomotives are almost entirely for export, so they are mostly tailor-made, hindering the application of mass-production methods. Yet basic components have been standardized and unit systems of construction worked out. Welding has been improved. Production planning has been applied. Details are in a new productivity report, "The Wheels of Progress—a review of productivity in the diesel locomotive industry." It is available for two shillings from the British Productivity Council, 21 Tothill St, London SW 1.



Good Gadgets

SEVERAL INNOVATIONS in the new air-conditioned office building of Landis Tool Co, Waynesboro, Penna, struck us as eminently practical. One is a small auditorium complete with projection booth. The screen is lowered or raised by power, the speaker's lectern is similarly adjustable by power for height, and the lights are controllable from a panel nearby. Lights can be dimmed in zones, and when the room is emptied and main lights cut off, a night light in the center of the ceiling comes on, enabling crossing of the unwindowed room without danger. Addressograph equipment, used by two departments, is set on casters so it can be taken readily from one to the other. Large vertical drawing boards in the engineering department can be lifted or lowered by power, as in aircraft practice. The president's office has windows opening on the sales department, so he can see if a particular member of the sales staff is in before he refers a call to him. No offices are labeled, and all have windowless steel swinging doors without knobs.

FOREIGN AID: The Trend Is Toward

Now that the "bloom is off the boom" in US business, some lucrative offshore procurement contracts are being reshuffled into the hands of US instead of European producers

WASHINGTON—A new trend is shaping up in foreign aid and lending operations to tailor them as closely as possible to the needs of US business. This could mean dollars in the bank for a whole range of American exporters and producers of goods for export.

The trend reaches across the board: economic aid, offshore procurement of military hardware, export-import bank loans, and the new program for disposal of surplus US farm goods. The underlying policy in all cases is that the government's foreign-financing schemes where possible should boost US production and trade.

Harold Stassen's Foreign Operations Administration has made some policy decisions lately that show which way the wind is blowing:

- FOA will buy a minimum of 10-million tons of coal for shipment abroad during fiscal 1955. Since foreign coal production reached its recovery goals some time ago, US coal has virtually dropped out of the aid program because under the old 50-50 clause of the aid law, US bidders on foreign contracts have been forced to ship their goods in higher-cost American bottoms. Now, FOA will pick up the difference between American flag and foreign flag shipping costs, so that the US bidder can submit a bid based on the lower foreign shipping rates.
- Stassen split a $2-million dollar order for locomotives and rolling stock for India 50-50 between American and foreign bidders—although the American bids were almost twice as high as those of foreign competitors.

The coal examples won't mean much to US machinery producers and exporters, but the locomotive deal will set a precedent for FOA procurement of manufactured products which could mean substantial new business for the American metalworking industry. FOA financed $187.5-million worth of machinery and equipment last year. In the first five months of this year, it financed $120 million worth. Total purchases of machinery and equipment since the start of the Foreign Economic Aid Program add up to nearly $1.5 billion.

Relative cost of US-made and foreign-made machinery will no longer be a factor in deciding who gets the business. The key thing now will be whether or not the industry in question is in economic difficulties. In practice, that is likely to benefit most makers of heavy custom-built equipment with a high labor content. Such equipment, because of FOA's old "lowest bidder gets it" policy, was rarely bought in the US because of high American labor costs.

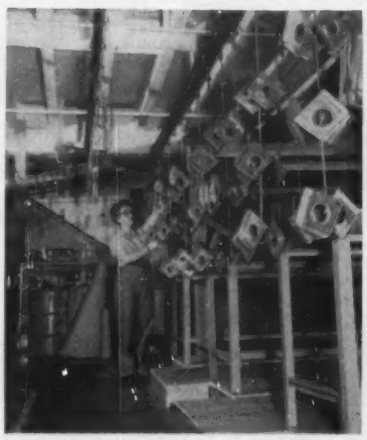
The shift in aid policy is almost certain to be reflected in the offshore procurement policy, too. The

Flow Coating Plane Parts Increases

HAWTHORNE, CALIF—One of the aircraft industry's first flow coating conveyor lines, unique in that it is used to apply zinc chromate primer to aircraft parts (most flow lines apply enamels), has been installed here at the plant of Northrop Aircraft Inc.

Basically a long booth-like chamber with dual banks of nozzles that spray paints on parts carried on a 320-ft conveyor, the flow coater differs from spray painting in that it applies paint at very low pressures. The line operates at 10 fpm, handles heavy and light parts, and will take sheet up to 5 x 20 ft, but because of conveyor configuration at Northrop parts are limited to 5 x 6 ft.

Northrop reports the flow coater has increased paint shop production 116%, and shop personnel has been cut 12%, with excess workers now on other assignment.



Loading

"CHRISTMAS TREE" HANGERS, spaced 12-in. apart, carry small parts through the conveyor

Spray chamber

TWELVE NOZZLES are used in this operation. Pressure and number of nozzles are controlled by operator

Making It a US Business Aid, Too

Pentagon is seriously considering shifting a fat slice of contracts given to Europeans for aircraft production under offshore procurement back to American producers. European plants would be shifted to making spare parts. Over a half-billion dollars worth of aircraft have been contracted for in Europe by the Pentagon in the last two years.

The idea behind offshore procurement originally was to beef up the European armaments industry so that Europe eventually could be made independent of American weapons aid. Two factors lie behind the program's current re-appraisal:

- It has proved difficult to adapt European production methods to the mass production of certain types of modern military equipment, notably in the aircraft field.
- Increasing responsiveness of the administration to the US aircraft industry's complaints that offshore procurement in effect released British government funds for subsidizing research and production of commercial jets in competition with the US industry.

The new philosophy isn't limited to the foreign aid field either. You can see it reflected in the Export-Import Bank's current drive to streamline credit facilities for US capital goods exporters. The Bank has always extended credit directly to American exporters in the form of "exporter" loans, so called to distinguish them from loans made to foreign governments or companies for the purchase of US products.

More Direct Loans

Exporter loans made up the bulk of the Bank's business before World War II, but the huge demand abroad for dollars following the war led to a profound shift towards government-to-government lending in the postwar period. Despite this, the Export-Import Bank has loaned more than $200 million directly to American exporters since the war ended.

Now the Bank is going all-out to boost the volume of this type of lending. This move is an explicit response to a growing demand from US exporters for credit to help them meet stiffening competition abroad. Many foreign governments extend credit or low-cost insurance facilities to their exporters. This didn't matter as long as the world was hungry for goods—foreign industries hit by the war couldn't produce them, and the US was shoveling out aid to permit foreigners to buy here.

American exporters could then move just about anything they wanted to. But with foreign output above prewar, a world deflation on, and US aid tapering off, American exporters are being pushed to the wall, and they want US help.

The Export-Import Bank has come up with a gimmick for streamlining exporter credit facilities. American capital goods exporters who've been operating abroad in the past will be given a "line" of credit commensurate with their past volume. So, instead of having to negotiate a loan for each sale, the US exporter can now offer his buyers' terms in advance of contract signing.

New exporters won't be able to qualify for this sort of help. They'll still have to approach the Bank on a deal-by-deal basis until they have built up a record of foreign business upon which a line of credit can be based. The idea is to protect the markets of the veteran exporters who have built up their businesses without government aid.

Paint Shop Output 116% at Northrop

Infra Red Dryers

THREE CONVEYOR LINES converge at the infra-red-lamp drying area, which has 192 heat lamps in two banks. One conveyor handles work from the flow coater, the other two handle work from the paint shop's spray booths

Inspection

THOROUGH GOING-OVER is given finished parts by paint department head and assistant foreman

ASME'S FALL MEETING: Automation

Machine tools for automation, stress-free machining, TV for conveyor lines, machine design—and Russia's engineering training program—topped the metalworking agenda for American Society of Mechanical Engineers' Milwaukee meeting

MILWAUKEE—Metalworking engineers and executives attending the Fall Meeting of the American Society of Mechanical Engineers at the Hotel Schroeder here on Sept 8-10 found an unusually worthwile program, including important papers on current developments and problems in production engineering, metal processing and materials handling fields. They also participated in plant inspection trips to Allis-Chalmers Mfg Co, Chain Belt Co, and Kearney & Trecker Corp.

Of special interest was a symposium discussion of results expected from new machine tools by the production engineer. In a paper on "Machine Tools for Automation" prepared for this symposium by Nevin L Bean, chairman of ASME's Production Engineering Div, and technical assistant to general manager, Automotive Transmission Div, Ford Motor Co, it was stated that operator safety, saving of space, ease in loading and unloading, and automatic production of parts to meet quality and print specifications are important prerequisites of machine tools for automatized production lines. Equally important, according to Mr Bean, is the need for the machine to "operate without mechanical failures as close to 100% of the time as can be attained, and that downtime due to tool changes be minimized to the lowest degree possible." This is usually accomplished by having tools standardized so they can be preset and changed easily and quickly.

"The cutting tools of an automatic machine," said Mr Bean, "can play a very important role in keeping the unit in operation. Transfer machines have been perfected to a point where tool control is placed on a scientific level. Devices have been created which will detect dullness in a cutting tool, flashing lights before the operator to indicate the need for tool changes."

An important point to keep in mind when tooling automatic machines, according to Mr Bean, is the importance of minimizing burrs or nicks that might occur through transferring from one station to another, or by the drawback of a tool over a previously-machined surface. Creation of a groove or valley in a machined surface by tool drawback can result in faulty production operations or improper assembly, Mr Bean stated. He also cautioned that repetitive control must be watched closely. Mechanical positive stops, he said, should be hardened and ground and, wherever possible, should be enclosed so foreign materials cannot accumulate on their faces. Even an accumulation of airborne dust on mechanical stops can vary machining tolerances, according to Mr Bean.

"Multiple blade boring cutters or flat milling cutters should," Mr Bean stated, "be installed on spindles which have been equipped with some type of torque control to indicate approaching dullness or breakage of the cutters. A warning light to the operator, indicating approaching dullness, will quite often eliminate cutter breakage, which often includes damage to machine spindles or other operating equipment." One successful application cited by Mr Bean was the installation of a dual electronic control, one side of which operated a warning light, and the other returned the spindle to its original position whenever spindle torque exceeded a preset limit. This application reduced average downtime from 4 to 6 hr on a 2-shift operated machine, without any loss of time as the result of tool or spindle breakage.

Machines for Short-Runs

During the same symposium, C H Borneman, senior machinability engineer, General Electric Co, stated that machine tools needed for small-lot production should be usable for a wide range of product with minimum setup costs, should have ample power to employ the full production capacity of the cutting tools within the machinabaility range of the material being cut, and should be designed to provide a proper range of speeds and feeds for the operations to be performed. In addition, said Mr Borneman, these machines should be rigid, accurate, and priced so they can be purchased by jobbing shops. He also asked for properly engineered cutting fluid systems, means for directing chips away from the working areas so the operator will not have to stop the cut frequently to clear away chips, and aids for speeding workpiece setup to minimize the noncutting portion of the machine's cycle. Automatic or permanent lubrication also should be provided wherever possible, he said. Physical effort required to operate the machine, and to load and unload workpieces, should be minimized by use of power devices wherever possible, according to Mr Borneman, since higher cutting speeds mean shorter machine cycles and more frequent operation of controls.

Carl J Oxford, chief engineer of National Twist Drill & Tool Co, speaking on the same panel, pointed out that for best cutting tool performance, the best features of the cutting tools must be combined with the best features of the machine tools. Four factors which affect tool life most are, said Mr Oxford, (1) rigidity of machine, fixtures, arbors and tools, (2) speeds and feeds—infinitely-adjustable ranges are desirable when a wide range of materials are to be cut, (3) adequate power—so at no time will there be any perceptible change under load in speed or feed rates, and (4) adequate cooling of tools and work, with cutting fluid delivered in adequate volume at proper pressure, and in proper directions.

Stress-free machining is becoming increasingly important in the machining of parts for jet engines, according to Michael Field, partner, Metcut Research Associates, who discussed machine tools required by the aircraft industry. He based much of his talk on experiences at various plants of Curtiss-Wright Corp, and showed a number of recently developed machines specially designed for

Again Grabs the Spotlight

work on jet engine parts. A number of these machines, he said, are equipped for mist-cooling.

Metal Cutting Research

How the production engineer can apply the results of metal-cutting research was the subject of another symposium of interest to metalworkers. Participants were: Dimitri V. Kececioglu of Allis-Chalmers Mfg Co, R S Hahn of the Heald Machine Co, A B Albrecht of Monarch Machine Tool Co, O W Boston of the University of Michigan, E H Lee of Brown University, M E Merchant of The Cincinnati Milling Machine Co, E T Neubauer of the Trane Co, Jesse G Sdano of Allis-Chalmers Mfg Co, and M C Shaw of Massachusetts Institute of Technology. It was evident from the discussion that much work yet needs to be done before the production engineer is provided with the data he needs for more than rule-of-thumb decisions as to optimum machining setups. This was summarized by Mr Shaw, who pointed out that "there are two general types of papers—those of a research nature and those containing material ready to be used in the workshop. Many papers of the first type are necessary before a good paper of the second type can be written."

Machine Design

In the field of machine design, W G Johnson, manager of research and engineering, Norton Co, presented a paper on "Progressive Transfer of Skills from Operator to Machine" that contains food for thought by metalworkers planning for automatic production lines. Mr Johnson concluded his paper, which dealt principally with problems involved in designing an automatic cylindrical grinder, with the observation that "there must be some point where there is an economical advantage to stop the design efforts directed towards the completely automatic machine." Each job has its own conditions, so the extent of automization which can be justified will vary, but as Mr Johnson points out, "A machine which is automatic requires careful attention to design details which not only keep it productive, but keep it producing acceptable first-quality work with a minimum of down time for control or expensive maintenance."

Television for Conveyors

One of the major new developments in the conveyor industry is the use of industrial television, according to B G Schneider, assistant chief engineer, Conveyor Section, Chain Belt Co, who presented a paper on "Developments in Conveying equipment." While his paper dealt principally with heavy-duty conveyors for handling bulk materials, some of Mr Schneider's remarks were of interest to metalworkers.

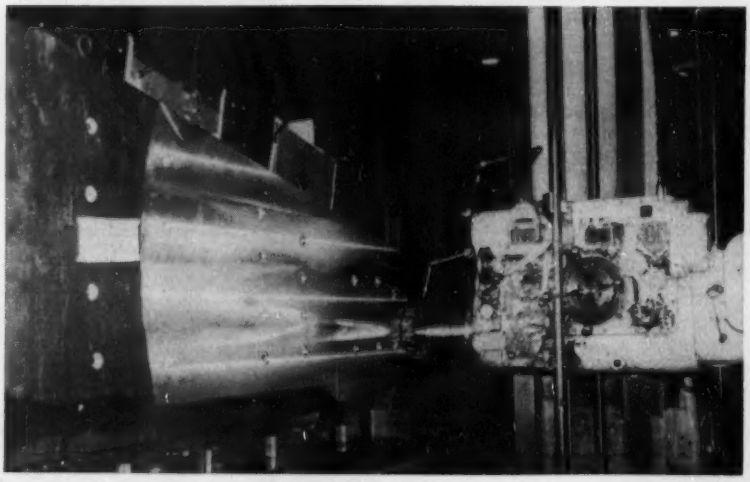
Mr Schneider believes that conveyor installations in future years will call for extensive use of industrial television, because by this means "control through observation" can be extended into areas of extreme heat, cold, chemical fumes or other conditions which normally exclude the presence of an observer.

During the same session, sponsored by ASME's Materials Handling Div, Donald R Scheu of B F Goodrich Co, described recent developments in conveyor belting. He credited improvements in belt reinforcements, rubber and rubber-like materials, and improved belt construction, for rapidly expanding use of belt conveyor systems. New resilient synthetic fibers provide greater shock resistance, and new coatings protect conveyor belts against chemical at-

Modern planes from hand forging

Stiletto-like Douglas X-3 jet . . .

ONE OF THE WORLD'S FASTEST PLANES, Douglas's supersonic twin-jet relies on hand-forged one-piece wing structure to withstand high stresses



gets its strength from hand forgings

BASIC WING STRUCTURE is machined at Douglas Aircraft from a 1-ton aluminum piece, hand forged at Aluminum Co of America's Cleveland Works. Forgings are machine tapered to wing contour, machined to an egg-crate pattern, and a tapered aluminum alloy skin is fitted to the wing structure

ASME (Continued)

tack, help them resist attack by sunlight, aging, and ozone deterioration.

Engineering Education in Russia

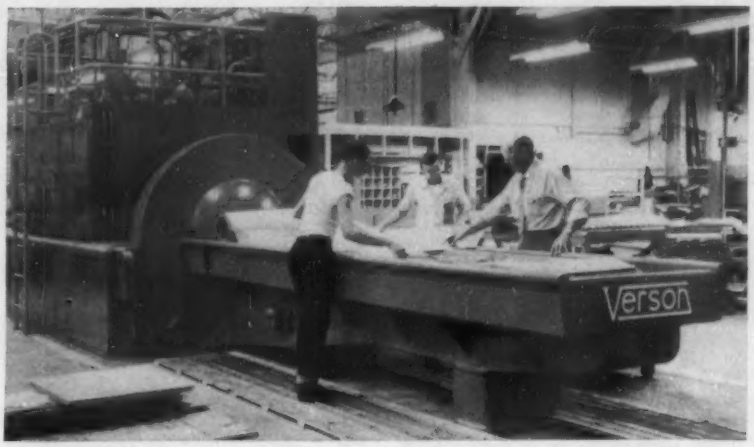
We are rapidly falling behind Russia in the training of engineers, according to M H Trytten, director, Office of Scientific Personnel, National Academy of Science, National Research Council, Washington, D C, who prepared a paper on "Engineering Education in Russia" for a session held under the joint auspices of ASME's Education Committee and the Engineering Manpower Commission of the Engineering Joint Council. Because of illness, Mr Trytten could not attend the meeting, and his paper was read by Thomas A Marshall, former secretary of the Engineering Manpower Commission.

In his paper, Dr Trytten stated that more than 50,000 engineers are being graduated from Soviet engineering schools this year, compared with only about 19,000 in the United States. He wrote that it is possible that the total number of trained engineers in Russia today is closely comparable to the number in this country.

Dr Trytten described the Russian engineering student's curriculum as consisting of about 65% of time devoted to general sciences and general engineering projects, about 28% to narrow specialization, and only about 7% to the socio-economic studies, which are mostly political indoctrination subjects. The training is supplemented with periods of practical work in industry. There is little of the American plan to train the engineer in cultural subjects, or to develop capacity for judgement.

Throughout the primary and secondary years of a Russian student's education, according to Dr Trytten, greater stress is placed on mathematics and other preparatory engineering courses than is done in this country.

This country's local control of education "may have been our greatest strength in the past but it may become our greatest weakness in the future," Dr Trytten stated. He urged a three-point program for American education—(1) improving high school science teaching, (2) expanding the training of scientists and engineers, and (3) adoption of a consistent policy for the preservation of professional manpower, especially engineering and scientific personnel.



High-Pressure Forming Press

PRESSING FORCE OF 19,440 TONS is achieved by this newly installed forming press at Northrop Aircraft's Hawthorne, Calif, plant, where it is used in Scorpion F-89D and Snark B-62 jet-planemaking operations. Press's inner liner is inflated to 7500 psi maximum, in much the same manner as an auto innertube, has double shuttle worktable. While one table is inside the press section, the other can be loaded, allowing continuous operation. Aluminum, steel and Kirksite form blocks are used in forming aluminum and steel parts

NEW RENEGOTIATION REGULATIONS:
$500,000 "Floor" Exempts Small Contractors

WASHINGTON — New amendments to the Renegotiation Law have exempted many government contractors and subcontractors from renegotiation altogether. Three major groups are affected by the changes:

The Exemptions

- All contractors and subcontractors whose defense business does not exceed $500,000 during a fiscal year ending after June 30, 1953. Renegotiation still applies to companies who did $250,000 worth of business with the government during a fiscal year ending prior to that date. Companies still doing defense business are required to file a statement of "non-applicability"—but this fulfills their obligations under the new law. The Board is now in process of mailing out statement-of-non-applicability blanks to US contractors.
- Contractors and subcontractors for standard commercial articles sold to the government are exempt. These articles include chemicals, electronic tubes, automotive parts, and so forth. Now, all commercial item sales made after Dec 31, 1954, are exempt. The new exemption requires that the contractor file information on sale of articles he considers to be within this exemption. Then, within six months, the Board will find either that (1) competition was sufficient to prevent excessive profits, or (2) that competitive conditions were insufficient. If the latter is the Board's finding, the items in question become subject to renegotiation. If not, the exemption applies.
- Producers of new machinery and equipment for government use will be granted an exemption. Previously, the law stated that subcontractors supplying the producers of such equipment were exempt from renegotiation, but the prime contractor wasn't. Now, the same exemption is applied to the prime. For example, the machine tool builder who either sells to the government direct or to a producer of a military item will now be renegotiated on only a portion of the contract price of new equipment sold to the government. The exemption does not apply, however, if the equipment can be adapted, converted or re-tooled for civilian use.

THE SAUGUS IRON WORKS:

Our Industrial Heritage Returns to Life

SAUGUS, MASS—The Saugus Iron Works, which might well be called the Cradle of American Industry, was formally opened to the public here September 17, climaxing six years of intensive research and the expenditure of $1,500,000 by the US iron and steel industry on its complete restoration.

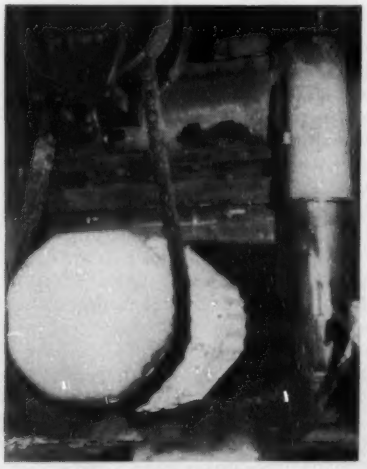
The restoration is an authentic reconstruction of the first successful iron works in the New World. While the Iron Works will not actually operate as it did more than three centuries ago, its essential ironmaking and metalworking units have been restored or reconstructed in minute detail.

Focal point of interest is a replica of the original stone blast furnace, complete with a 16-ft water wheel and giant leather bellows. Nearby is the forge, where cast iron "sows" were reheated and worked into bars. A 505-lb iron hammerhead stands poised over the anvil. A smaller wooden building houses rolling and slitting machinery to produce as an ultimate end product the nails so much in demand in colonial America.

Also on exhibit are the old warehouse and shipping wharf, and the restored Ironmaster's House, with period furnishings, and the Iron Works' Museum.

Forging in 1650 . . .

A SAUGUS IRON WORKS GUIDE DEMONSTRATES THE FORGE HAMMER. Three hundred years ago possibly one of his very ancestors held a cast iron "sow" under Saugus's 505-lb iron hammerhead to beat it into wrought iron bars



. . . and in 1954

BY WAY OF CONTRAST, today's forging presses turn out giant steel ingots like this 500,000-pounder

30-gallon stainless steel tubs are deep drawn . . .

on a 650-ton press

Deep Drawing Chow Tubs for the Navy

GALLEY TUBS FOR THE NAVY are produced at Hydraulic Press Mfg Co, Mount Gilead, Ohio, by deep drawing on a 650-ton press—a method that is proving faster and more economical than rolling and seam welding. Finished tubs are 24-in. in dia, and 18-in. deep. Press has 30-in. stroke

AFTER FINAL DRAWING, the tub is rolled at the top. A stainless steel band is spot welded on for the base, and handles are attached

Eaton Applies "Do It Yourself" to Carbides

Cleveland's Eaton Mfg Co is producing all but 2% of its tool requirements for 14 divisions. The results, in terms of output and tooling costs, have been spectacular

CLEVELAND—Eaton Mfg Co's Powdered Metals Division is currently producing some 200,000 carbide tool bits and dies a year for a very select group of customers—Eaton's 14 manufacturing divisions. Now, a few months after Eaton okayed the project, the Powdered Metals Division produces all but 2% of carbide tool requirements—the special ones.

Tools are sold to the various divisions on a competitive basis, in about 10 carbide types. Plant inventories are held to a 7- to 10-day level, instead of the previous 90-day inventory, with the Powdered Metals Division carrying the real inventory.

Some $250,000 a year are saved on tools formerly scrapped—by transferring no-longer-used types or shapes to other divisions and salvaging a smaller shape from a larger broken one. And understanding is much better in top management of the need for machine tools new and rigid enough to use carbides effectively.

Tooling Liaison

Powdered Metals Division has a carbide specialist in each of the user division's plants who sparkplugs the study of obsolete tools to make sure his products are used efficiently. He is also the major factor in avoiding use of more costly special carbide shapes. And he passes on information to other PMD specialists in other Eaton plants. In effect, he acts as a tooling liaison man.

At Eaton Saginaw, tappet-body output per set of cold-header dies has risen from 300,000-500,000 to 850,000-1,000,000. At Eaton Massillon, 1.25 million to 1.5 million washer pieces are drawn from 425,000 lb of steel—saving 75,000 lb of steel while producing 10% more. At Eaton Battle Creek, the valve division has lengthened tool life 1 to 5 times with a special carbide grade. Tool tips are now made by brazing together 3/16 or 1/4-in. wafers. If the cutting edge is damaged, any resulting crack stops at the first braze, saving a considerable amount of material.

Tool Care Program

Eaton's Powdered Metals Division recently instituted a tool-care program to reduce wastage of carbide tools. Training lectures, tool design, tooling of machines, and grinding tool will all be included.

New Materials

Currently, PMD is developing high-temperature ceramic-metal combinations. One, for example, will stand 40,000 psi (rupture) at 1500 F after 250 hr, and 15,000 psi at 1800 F after 300 hr. Another, without strategic components, is able to withstand 30,000 and 10,000 psi under those conditions.

Eaton may offer its carbide service to outsiders eventually, on a plant-wide basis. Tool research and design, tooling up, and servicing would all be included.

SWEDEN EYES RUSSIAN METALWORKING MARKET

STOCKHOLM—Negotiations are under way here with a Soviet trade delegation to see if Sweden's 200-million-crown ($40 million) current trade agreement with Russia can be extended. Sweden hopes that Russia will increase "sale" of petroleum products from 600,000 tons under an expiring postwar agreement, to 1-million tons.

In exchange, Sweden wants to "sell" metalworking equipment and capital goods for consumer industries. Reason: Swedish metalworking is feeling the pinch of export competition from Germany, and inflation at home.

SPAIN TO PRODUCE 10,000 CARS A YEAR

MADRID—Sociedad Espanola de Automoviles de Turismo (SEAT) plans to produce 10,000 passenger cars a year "within a very short time," according to the firm's president. Ultimately, when the market can absorb them, SEAT plans to produce 20,000 cars yearly.

All mechanical components, including engine, clutch, gearbox, transmission and differential, are produced at Barcelona. And, recently, 82 new presses have been installed, including an 1800-ton-per-sq-in. US-made Clearing press, weighing 400 tons.

ITALIAN-DESIGNED PIPE PLANT FOR MEXICO

VERA CRUZ—"The most modern steel pipe plant in Latin America," designed by Italian engineers and largely equipped with Italian-made automatic pipe machinery, began production here recently.

The $10-million plant will turn out approximately 50,000 tons a year of seamless steel pipe. Initial production is designed for Mexico's oil industry, with expected expansion to double capacity in the near future enabling the plant also to supply the country's chemical industry. Pipe is made in 2⅜ to 7-in. dias to American Petroleum Institute standards. Some 600 workers are employed in two shifts.

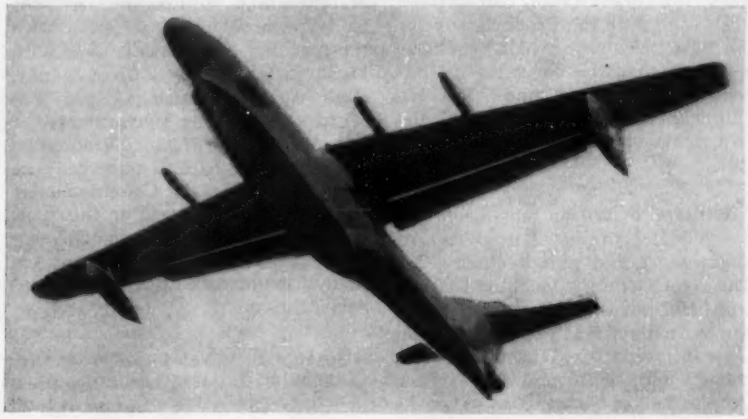
AUSTRALIA TO BUILD JEEP-TYPE VEHICLES

MELBOURNE—The first made-in-Australia jeep-type vehicle will be produced here by J A Lawton & Sons Ltd of Adelaide. The firm plans to spend $1.5 million for output of about 2000 vehicles a year for the Australian and export markets in South Asia and the Pacific Islands. The first vehicles, according to present plans, will come off the production lines late in 1956 or early in 1957.

BRITISH AFRICA INCREASES DOLLAR GOODS BUYING

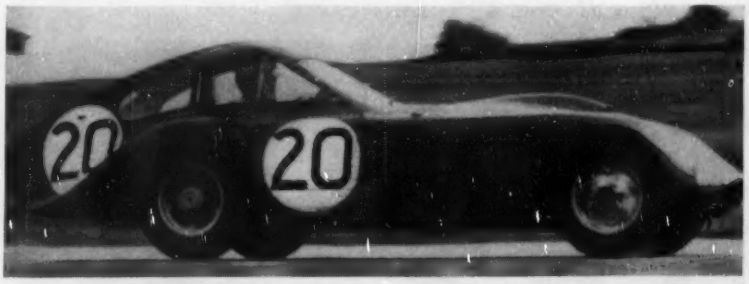
JOHANNESBURG—More non-sterling currency will shortly be made available to importers in the Central African Federation, who will be allowed to spend some $38 million for industrial, mining and agricultural machinery, steel and electrical equipment, from the dollar area. South Africa, too, is being urged by its businessmen to allow free imports of capital goods to boost its output.

New British Designs



. . . in planes

ROCKET-PROPELLED MODEL PLANES like this one are used by Saunders Roe Ltd, British aircraft firm, to test behavior of hull shapes. This model of a flying boat is powered by a 10-lb-thrust rocket motor. Tests are made with these models in tanks, at sea, and on rivers and lakes



. . . and in sports cars

SOMETHING NEW IN SPORTS CAR SHAPES is this British Bristol 450, made by the Bristol Airplane Co. The closed, super-streamlined 450 recently captured 2nd, 3rd and 4th places in the 2-liter class at the 12-hr international race at Rheims, France—and made a clean sweep (1-2-3) at Le Mans in June

Philip O Geier, Jr

James C Kelley

D S Harder

Names in the News . . .

Philip O Geier, Jr, has been appointed sales manager of the Cincinnati Milling Products Div, Cincinnati Milling & Grinding Machines, Inc. Mr Geier has been associated with the organization for fifteen years, and with the Products Div for the past three and a half years. He will be responsible for sales of Cimcool cutting fluids and "Positive Duplication" grinding wheels, the two principal products of the division.

William F Wilson has been appointed vice president in charge of engineering and manufacturing for The Gear Grinding Machine Co, Detroit. He moves up from his post as works manager. Prior to joining Gear Grinding, Mr. Wilson was associated with Kearney & Trecker Corp's Walker-Turner Div as works manager.

Price Berrien has been appointed general plant manager of the National Screw & Manufacturing Co, Cleveland. He was formerly plant manager for the Russell, Burdsall & Ward Bolt and Nut Co, Los Angeles.

James C Kelley has been appointed general manager of the American Machine Tool Distributors' Association. He has been serving as deputy director of the Commerce Dept's Metalworking Equipment Div. Mr Kelley, whose first association with the machine tool industry was with Monarch Machine Tool Co of Sidney, Ohio, was cited during World War II for outstanding performance of duty with the Navy's Production Branch, and in 1952 received the Junior Chamber of Commerce Arthur S Fleming Award as the "outstanding young man in Government," for contributions made in the field of metalworking equipment administration.

Joseph D Loveley has been appointed to the new post of vice president in charge of engineering of Chrysler Corp's Airtemp Div, Dayton. Mr Loveley has been associated with Chrysler since 1935. In 1941 he was made chief inspector of the Airtemp Div; after serving as assistant chief engineer, he was appointed chief engineer, his most recent assignment, in 1950.

D S Harder, vice president, manufacturing, of Ford Motor Co, has received the first annual Presteel Award, presented to the man or company contributing most to the advancement of the metal stamping industry. The award, presented by Worcester Pressed Steel Co, which is sponsoring it in cooperation with the Pressed Metal Institute, was given to Mr Harder at the annual PMI convention held recently at Murray Bay, Canada, "for his contributions to enlarging the field of metal stamping through automation, through encouraging employee-training to provide more men skilled in pressing metal, and through openly sharing his ideas with the industry."

Earl J Clark has been appointed sales manager of the Set Screw & Manufacturing Co, Chicago. He succeeds **Russel Livingston,** who has resigned.

J P Coughlin, former manager of Westinghouse Electric Co's Welding Div in Buffalo, has joined Eutectic Welding Alloys Corp, New York, as assistant to the president. During his fifteen-year association with Westinghouse Mr Coughlin was in charge of welding, sales engineering, and production.

Price Berrien

Joseph D Loveley

J P Coughlin

Ralph F Hornbach

Fletcher Gleason

Marc Bendick

Ralph F Hornbach, director of purchasing for the Geo D Roper Corp, Rockford, Ill, for the past four years, has been named general manager of the newly-created Special Products Div. **Wallace Hollingsworth,** purchasing agent, succeeds Mr Hornbach.

James M Molpus has been appointed general manager of the Longview, Texas, Div of R G Le Tourneau, Inc. **Ben W LeTourneau** has been named to take over Mr Molpus' former assignment as general manager of the Mississippi Div at Vicksburg. **Harry S Clark,** who has been Texas Div general manager, has been named general manager of the newly-created Steel Products Div. This new division incorporates all of the steel mill operations at Longview, and is slated to expand production of steel plate, plate shapes, and fabricated structures. It operates as a separate facility instead of as a subordinate phase of main plant production.

Edward R Anderson has been elected a vice president of American Brake Shoe Co; he will continue to serve as president of the AmForge Div. Mr Anderson joined the company in 1930. He was appointed vice president of the Kellogg Div in 1949, vice president of the Brake Shoe & Castings Div the following year, and has headed AmForge since 1952. He will continue to be located at the Chicago office of the company. **Norman Birch** has been appointed vice president in charge of operations of the National Bearing Div; **I Eugene Cox** has been named vice president in charge of engineering and development; and **Bernard Esarey** works manager of the Meadville, Pa, plant. Both Mr Birch and Mr Cox will be located at division headquarters in St Louis, Mo.

Fletcher Gleason has been named to head Lees-Bradner Co's newly-formed Cri-Dan Div. The division will have its own separate staff of sales, service, and engineering personnel exclusively occupied with matters pertaining to the Cri-Dan line of high-speed threading machines. Mr Gleason was formerly chief processing engineer for the Cleveland company.

Harold J Mock has been appointed executive vice president of General Metals Corp, San Francisco, and general manager of the company's Adel Precision Products Div. The division produces hydraulic and pneumatic equipment for aircraft, marine, and industrial fields. Mr Mock was formerly director of guided missile manufacturing for Hughes Aircraft Co, and director of industrial engineering for Ford Motor Co. **William F Harper** has been named administrative assistant to the president. He was formerly associated with Consolidated Vultee Aircraft in San Diego.

Mrs F W Derbyshire has been elected president of the F W Derbyshire Corp, Waltham, Mass, manufacturer of jewelers' lathes and collets. **Richard F Derbyshire,** her son, has left the company to go into business for himself.

John Cook, Norton Co grinding department foreman, retired Sept 1 after 43 years with the organization. Mr Cook was for many years a demonstrator and salesman of Norton machines; he served as district manager in the Philadelphia and Syracuse areas until distributor selling replaced direct selling in the territory. **Stewart O Bailey,** acting general foreman, has been named to succeed Mr Cook.

Marc Bendick has been elected president of the Barnaby Manufacturing Co, Bridgeport, Conn, tool manufacturers. He succeeds **Barnabus Toth,** who has retired as active head of the firm. Mr Bendick recently headed Bridgeport Industries, Stratford, Conn, fabricators of aircraft parts. **Louis F Kutscher** has been named sales manager; **Jack Stock,** treasurer; and **Harold Saunders,** superintendent.

George S Chiaramonte has been appointed to the newly-created post of general sales manager of E Horton & Son Co, Windsor Locks, Conn. The former Horton Chuck Div sales manager will now direct sales of both divisions of the company, Gapp Special Products and Horton Chuck.

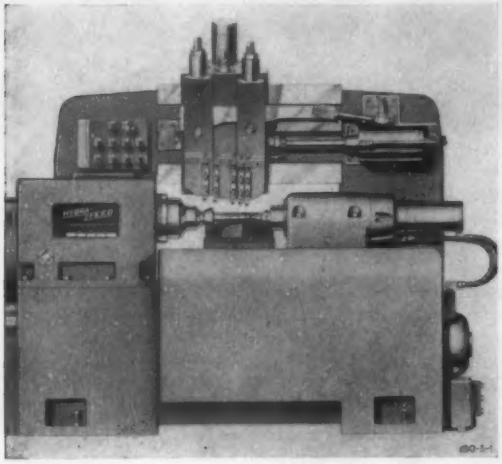
OBITUARIES

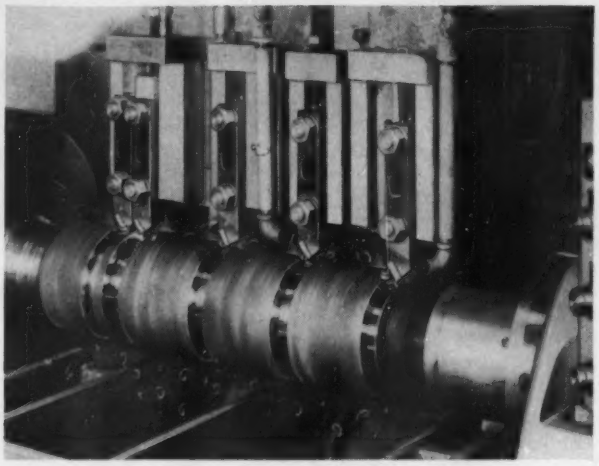
George L Detterbeck, 80, founder and president of the George L Detterbeck Co, Chicago manufacturers of screw machine tools, died Aug. 24. Mr Detterbeck, designer of special cam and tool cutting equipment, established the firm in 1911.

Henry E Hund, Reo Motors, Inc, board chairman, died Sept 10 at Henry Ford Hospital, Detroit. Mr Hund began his automotive career in 1905 as a clerk for American Car & Foundry Co. He had been president and general manager of Reo since 1940, and chairman of the board since 1948, when he retired as president.

Marvin W Lewis, 86, identified for more than 40 years with the machine tool trade, died Sept 7 in Cleveland. Mr Lewis founded the Lewis Machine Co, makers of wire straightening and cutoff machines, in 1913. He had actively directed the Cleveland company until a few years ago.

New Shop Equipment,





Hydra-Feed Enters Automatic Lathe Field

Designed for automation, maximum carbide performance, high rates of metal removal, and automatic chip removal, a line of automatic lathes is announced by Hydra-Feed Machine Tool Corporation.

The direction of rotation is reversed from normal practice, making possible the elimination of usual tooling from the front of the machines — resulting in a completely unobstructed loading area. Tool pressures on rear tools are 'downward' instead of 'upward' as on conventional automatics. Combined cutting speeds and feeds giving metal removal rates as high as 52 lbs per minute have been used successfully. Also, with reversed rotation and elimination of usual front carriage, chip flow is unobstructed through full-width, full-depth chip chute provided.

Elimination of the usual chip removal problem is of particular importance with the Hydra-Feed lathes in view of the high metal removal rates which the machines make possible. Indicative of metal removal rate is the power for which the machines are designed. For instance, on Model HD-8, a motor of 30 hp at 1800 rpm is recommended for the spindle and main drive. Model HD-16 calls for a 100-hp motor. Proportionate motor sizes are provided for on the 12 and 24 models. Spindle speeds are infinitely variable and range from 82 to 2400 rpm on the HD-8, from 98 to 1475 on the HD-12, and from 66 to 1072 rpm on the larger models.

In view of these performance characteristics, the unobstructed and open front provides advantages — even without automation — in reduced loading time, easier setup, and reduced operator fatigue. Accessibility is emphasized by the fact that distance from front of bed to spindle center is only about 11¾ inches on the HD-8, for example.

Design of each of the new Hydra-Feed lathes conforms to both hydraulic and electric JIC standards. All tool blocks and slides, as well as the work, are in easy reach of the operator for accessibility in making any needed adjustments — even where multiple tooling and slides are used.

Hydraulically operated carriages and slides may be set to perform automatically practically any combination or sequences of operations. Each carriage or slide may be operated independently, however, through selector switches and pushbuttons on the single central control panel.

Automatic multiple cycling is provided for on these machines when desired, permitting consecutive roughing and finishing of parts in the same setup and the same tooling without stopping the machine. This feature is particularly important where unusual total depths of cut are called for at some points of the work.

Either cam control of carriages and slides or tracer operation are available. Rear as well as top carriages can be adapted for longitudinal feeds. All models can be supplied either with the hydraulically operated Hydra-Feed tailstock or with standard or special plated slides. The latter are particularly suitable for straight or contour boring, facing, grooving or plunge-cut operations.

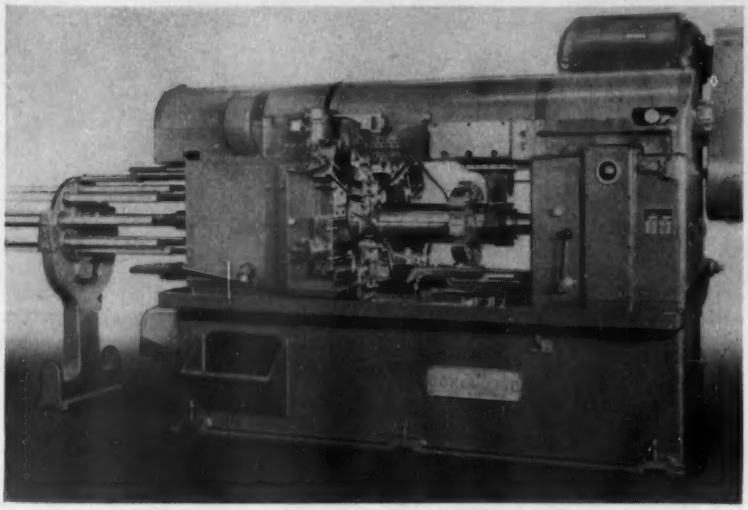
Hydra-Feed Tool Corporation, 730 W Eight Mile Road, Ferndale, Mich

Hardness Tester

Olsen automatic Brinell hardness tester, which handles ten specimens per minute, has a built-in roller conveyor and air-operated lift which places each specimen in turn in test position quickly. All operations are controlled by foot pedal; operator merely watches the direct reading gage. Specimens falling within tolerance are returned to conveyor.

Tinius Olsen Testing Machine Co, 1006 Eastern Road, Willow Grove, Pa

Materials and Parts . . .



Eight-Spindle Bar Automatic Provides New Design Features

Cone Automatic Machine announces a 1⅝-in. Model VE eight-spindle bar automatic, the latest edition to its seven-model line of eight-spindle machines. Additional work spindles and tool positions of Eights are particularly adaptable to work that requires a number of standard or special operations to minimize second handling. Eights are efficient in machining components that require hole drilling of more than average depth, particularly if one or more other endworking operations are required. They provide stock-feed facility in fifth position.

Model VE has been designed with many of the better qualities of previous Conomatic Eights and Sixes incorporated. In addition there are the following individual features: stronger machine frame with substantial support to average range of work requiring motor drive between 30 and 60 hp; large diameter power transmission shafts and bearings; tooling area 12 in. larger than that of current model; longer main-end slide for longer work with swing clearance for die heads that will thread diameters up to full round collet capacity of the machine, and with accomodation for heavier and larger type of tool and attachment heads required for use of carbide tools.

Additional specifications include: 3.6 sec. minimum work cycle; 8 min. maximum work cycle; a 1.8 sec. idle time; a two-train change gear range of 42 work spindle speeds from 125 through 2.47-rpm; a two-train range of selective tool feeds for each work spindle speed provided by 12 pairs of change gears; and special seal and trap provisions to prevent intermixing of the forced system lube oil and coolant, (20 gal. lube reservoir and 125 gal. coolant reservoir).

Machine also incorporates: five standard independently actuated box-type main cross slides, affording seven tooling positions and provision for three auxiliary cross slides; identical main cross-slide toolholder slots for complete interchange of flat, dovetail, and circular form toolholders; provision for radial location of cross-slide toolholders without moving holders or positive stops; duplicate controls on both sides of machine; and adjustable mechanical stock feed with 7-in. maximum standard.

Cone Automatic Machine Co, Inc, Windsor, Vt

. . . including

Gap lathe has sliding bed built in two aligned sections with screw jacks supporting bed overhang . . . . . page 166

Form grinder takes cylindrical work and circular form tools to 8 in. in dia . . . . . page 167

Coolant aerator connects directly to coolant line, mixes it with atmospheric air page 168

Belt polishing machine has contact wheel, idler wheel, and drive motor mounted on single base . . . . . page 172

Bench optical comparator has 6-in. workspace from lens system centerline to stage working surface . . . . . page 172

Degreaser combines chemical cleaning with compressed air agitation . . . . . page 174

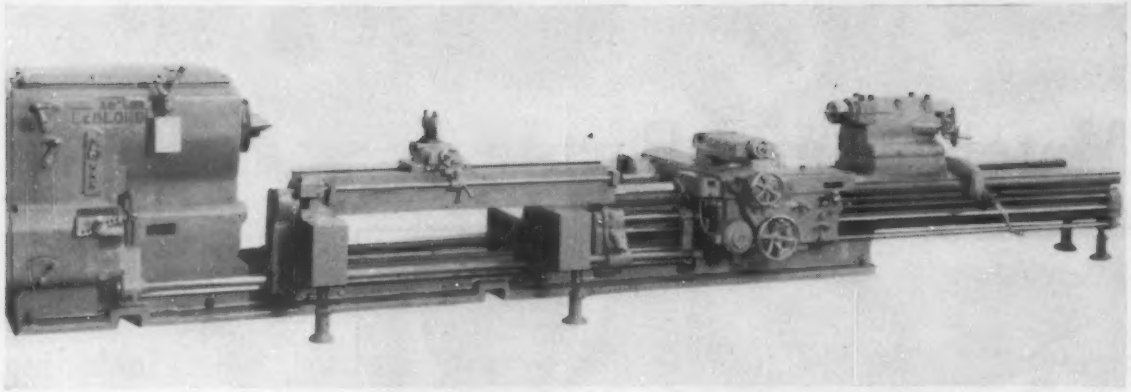
Fixture key with five tongues fits mill table slots from 9/16 to 13/16 in. . . . . page 174

Small electromagnets designed for use with mobile materials-handling equipment page 176

. . . and in Oct 11

Tracer-controlled engine lathe allows use of entire capacity of 18-in. machine for tracer work.

Gear surface hardeners incorporate electronic control mechanism.



LeBlond Gap Lathe Has Sliding Bed

There are three models in this line: the 16/32 in.; 25/50 in.; and 32/60 in. The sliding bed is built in two aligned sections, the upper bed movable over the lower by coarse-pitch screw. Two screw jacks support the bed overhang. Distance between centers, closed to extended, is 6 to 10 ft, 8 to 13 ft, and 7 to 12 ft, respectively. Large face plate diameters are 38, 45½, and 57½ in.

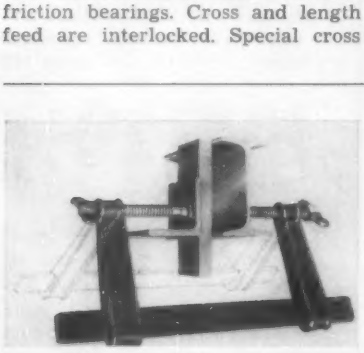
The apron is a double-walled casting with rack pinion, rack wheel, and handwheel mounted on anti-friction bearings. Cross and length feed are interlocked. Special cross slide puts cutting tool in position for all cuts in gap; carriage handwheel is mounted on extended shaft.

Headstocks incorporate heat-treated gears and splined shafts. Lever affords selection of 24 speeds on the smaller, 32 speeds on the two larger models. Spindle of the smaller is mounted on three anti-friction bearings, the others on four. The totally enclosed gearbox has quadrant gear and all shafts mounted on anti-friction bearings. The smaller model has 60 feeds, the larger have two option ranges of 48 feeds. The tailstock is thrust-lock type with handwheel located at an angle to the spindle.

Automatic lubrication is provided to headstock gear train and bearings as well as quick-change gearbox. On the 16/38-in. model, one-shot lubrication system supplies oil to all apron bearings, cross slide, and bed ways. These are automatically lubricated on the larger models.

Standard spindle speed range of the three models is 11 to 673, 5 to 600, and 5 to 500, respectively. Standard feeds are 0.0025 to 0.152, 0.004 to 0.250, and 0.004 to 0.080 in.

The R K LeBlond Machine Tool Co, Cincinnati 8, Ohio



Beam Welding Clamps Reach Over Flanges

Two clamp jaws with 3½-in. spindles on a high-carbon steel bar are for clamping weld work despite obstructions. Pressure plates at spindle ends allow turning, but not swiveling, so bar may be rotated out of the way of the welding rod.

Jaw castings are Grade A malleable iron, and spindles have Acme threads that are copper-plated. Throat depths of 4, 5, and 7 in. are available, and maximum distances between jaws range from 8 to 36 in., but with the 5-in. size supplied with a 48-in. opening.

Wetzler Clamp Co, 43-15 — 11th St, Long Island City, NY

Protective Caps

Line of face shield and welding helmet protective cap combinations is equipped with "Speedy Attachment" for connecting shields and helmets to caps of any size or shape. Device eliminates need for special tools or fittings on cap. Helmet or shield is firmly secured by means of a patented clip, held in tension by adjustable neoprene band.

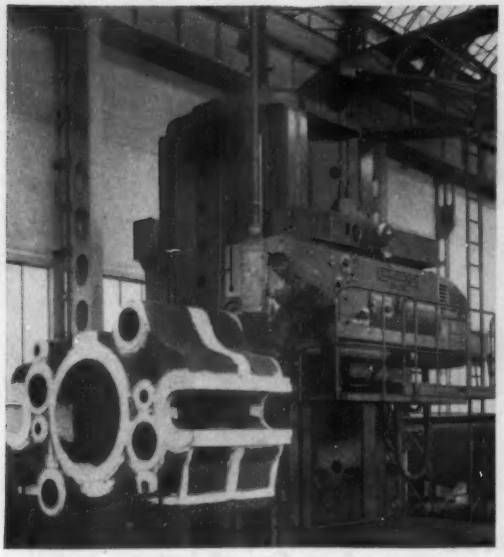
Davis Safety Div, Davis Emergency Equipment Co, 45 Halleck St, Newark 4, NJ

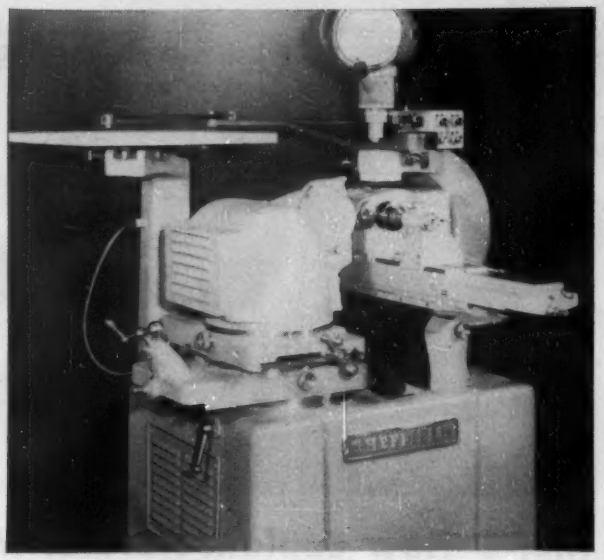
Low-Pressure Valve

Modernair solenoid-operated, four-way, five-port valve is available for low pressure systems. Pilot pressure, equal to operating line pressure, is employed to shift valve spool, thus permitting use of small, continuous-duty solenoid directional valve, and eliminating need for large, expensive, directly-connected solenoid actuators. Various spool and spring centering or spring offset combinations are available.

Modernair Corp, 400 Preda St, San Leandro, Calif

SWING FRAME GRINDER, Model PB-1, for use with a grinding wheel buff or abrasive belt can be suspended and thus brought to heavier work. It can be rigidly mounted and used as variety grinding and polishing unit. Features are said to include: compact design, rugged construction, adjustable balance, high speed, maneuverability, positive and convenient tracking mechanism and belt tensioning. The 3-hp motor produces 3400 rpm, thus providing a maximum surface speed of 7700 sfpm — *Imported by Curtis Machine Corp, Jamestown, NY*





Italian Boring Mills Feature Horizontal Feed of Headstock

Innocenti floor- and planer-type horizontal milling and boring machines have a unique spindle design. The spindle sleeve, supported in the quill by tapered roller bearings, rotates integrally with the boring spindle, but has no horizontal travel, and serves as a rigidly supported milling arbor for mounting arbor and face mills. Such milling operations are possible by virtue of the horizontal feed of the headstock.

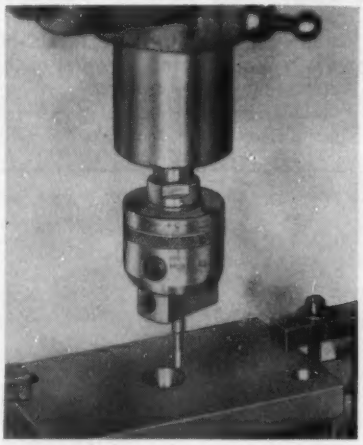
Feed of the headstock raised the problem of maintaining equal load distribution on the horizontal slides and vertical ways. The new design incorporates movable couplings which support the headstock at its center of gravity at all times, moving with the headstock. The coupling point is adjustable to permit balancing after adding heavy attachments.

Unequal loads on the vertical ways, caused by the combined headstock and carriage, are balanced by use of leveling jack and variable delivery pump. Compensation for heavy attachments is also provided in the vertical direction, the operator reading a dial gage and adjusting the balance by a control wheel within reach.

Improvements in the hydraulic circuit include: addition of accumulator; circuit enclosed and insulated; filtering of oil before pump intake; high-pressure pumps; and safety interlock switch.

There are three models of different capacity. The following refer to the smallest, the 140/95: Longitudinal travel—spindle, 39⅜ in.; headstock, 15¾ in.; column (planer type), 39⅜ in. Vertical travel of carriage, 78¾ in. Dia of boring spindle is 3¾ in.; dia of milling arbor is 5½ in. Spindle speed is infinitely variable from 6 to 1000 rpm; feed of all units ranges from 0.025 to 63 ipm.

Imported by The Innocenti Corp, Room 7512, 350 Fifth Ave, New York 1, NY



Read 0.0001 Direct On Boring Head

Offset dove-tailed toolholder slide is moved by micrometer screw for rough location of tool on jig-boring job. Scale on OD of tool body is calibrated against predetermined pressure on the gibs, which eliminates backlash and allows tool adjustment to 50 millionths on the radius.

Components are heat-treated and ground, and include a choice of shanks. Accuracy is guaranteed.

Precision Tool & Mfg Co, 1305 So Laramie Ave, Cicero 50, Ill

Grinder Takes Cylindrical Work And Circular Form Tools

Model No. 123 Micro-Form grinder will grind cylindrical work and circular form tools up to 8 in. in diameter and 8 in. in length. It permits finish grinding directly from a drawing, requiring neither templets nor masters. It is available with either a 30-power scope or 30-power combination screen and scope. It may be furnished with either live- or dead-center workheads. The pantograph has a ratio of 50 to 1, and the drawing table will accommodate a 20x20-in. drawing. Maximum size grinding wheel used is 7 in. Neither the spindle nor the workhead need be adjusted vertically as both are in a fixed plane.

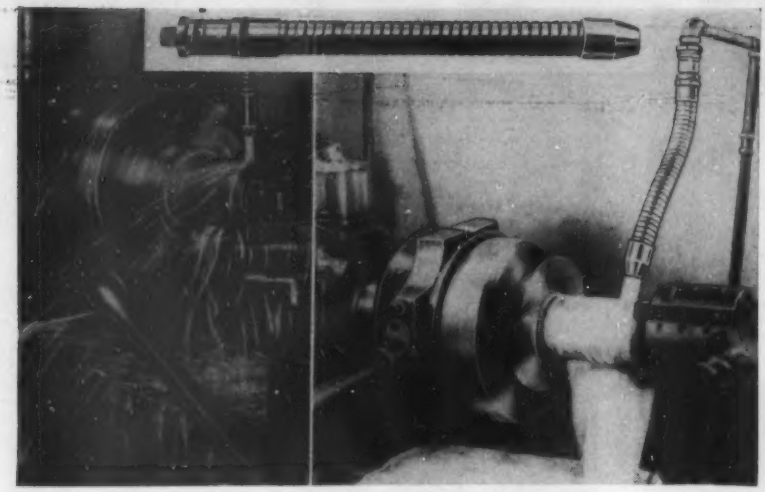
The wheelhead, V-belt driven by 1-hp, 1275-rpm ball-bearing motor, provides a spindle speed of 3000 rpm. The gear-driven workhead, equipped with change gears, is powered by a 1/3-hp 1800-rpm motor, providing workhead speeds from 40 to 360 rpm.

The Sheffield Corp, Dayton 1, Ohio

Magnetic Separator

Magnetic agitator separator has been designed to reclaim steel containing expensive metals such as nickel, cobalt or tungsten, chromium, etc, from non-magnetic material—for example, the media employed in grinding, polishing, and tumbling operations. Unit was designed for metals having a magnetic content of 20% or more. The non-electric separator is said to have indefinite magnetic strength.

Eriez Manufacturing Co, Erie, Pa



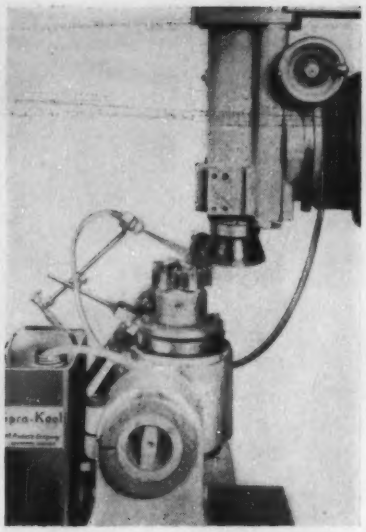
Mel-O-Flow Coolant Aerator Mixes Coolant With Atmospheric Air

Aerator connects directly to the coolant line and mixes atmospheric air with coolant resulting in a non-splash mixture which clings to work and tools and reduces centrifugal throw-off. Advantages claimed for the superior wetting action include better cooling, longer tool life, less downtime, and increased production.

The unit may be used with soluble oils of any ratio, and also with light oils, on any type of machine tool, on any metal. A self-cleaning mechanism prevents the aerator from clogging by purging it of chips and slugs, allowing uninterrupted machining. The self-cleaning operation occurs automatically whenever the coolant supply is turned on and off. Tool adjustments can be made while coolant flows.

All wearing parts are manufactured to close tolerances and hard-chrome-plated. Units are furnished with ⅜-in. pipe connector and operating range is 5 to 60 psi.

Melard Manufacturing Corp, 432 Austin Place, New York 55, NY



Spray-Coolant System Eliminates Dry Grinding

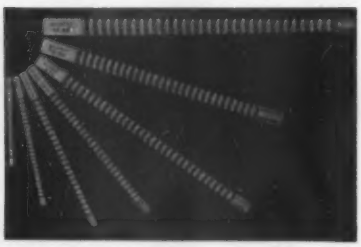
Spray-Kool system for applying spray coolant to any type of dry grinding or polishing operation, as well as certain drilling, milling, chamfering, or boring operations that do not require flood coolant, is designed with valve and spray nozzle which provide uniform jet spray to tools and work. Cooling action reportedly combines advantages of rapid evaporation and forced air jet penetration at point of work-wheel contact. A rust inhibitor mixed with the coolant also prevents tarnish and rust stains.

The mechanism is designed for quick setups and easy use. A length of hose is attached to any airline, the nozzle is then positioned to the work, and the spray control is adjusted to provide maximum cooling results. There are no pumps, settling tanks, or complicated filters; no splash guards or drain pipes are needed since excess spray evaporates quickly.

The amount of coolant applied is varied by adjusting air pressure or raising or lowering siphon level of coolant. Operation is unaffected by sudden or varied drops in air pressure. One gallon of the spray coolant is sufficient for 4 to 6 hours of continuous operation.

Spray-Kool is adaptable to any make of machine without special equipment. The complete unit includes a 1⅞-in. capacity adjustable clamp, full universal knuckle, air control valve, spray nozzle, 4 feet of air hose, 3 feet of rubber tubing, and a gallon container. List price is $44.50

Bar Products Co, 3703 Highcrest Rd, Rockford, Ill

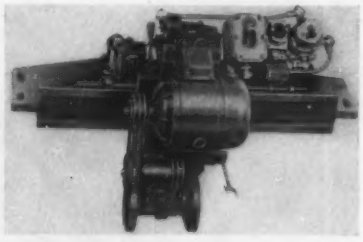


Square Broaches Added To Minute Man Line

Minute Man line of HSS square broaches, starting with a round pilot, has been designed to finish a square hole in a drilled, reamed, or cast bore in one pass, in less than one minute. Tool may be used in either a hand-operated arbor press or a hydraulic press.

Eight standard sizes are available from stock, from 3/16 to ¾ in. square, precision manufactured to close tolerances. Can also be furnished in nonstandard sizes and special rectangular and hexagonal shapes.

The du Mont Corp, Greenfield, Mass



Portable Roll Grinder

Mounting brackets for this unit are permanently mounted on the machine to be serviced. Setting is adjusted with two adjusting screws. Chain drive is powered by 1/3-hp, 110-volt, single-phase, 60-cycle motor, and travels in ground dovetail ways, feeding automatically along the work.

Two grinding wheels are powered by 5-hp, 220/440 volts, 3-phase, 60-cycle motor. Unit feeds down automatically and reverses at the end of the pass.

Quality Industries, Inc, 3716 Clark Ave, Cleveland 9

A MESSAGE TO AMERICAN INDUSTRY • ONE OF A SERIES

RESULTS OF AN INTELLECTUAL REVOLUTION . . .

"The Western Miracle" Continues . . . More Automatic Controls for Industry

Within recent weeks three new monthly technical magazines devoted to automatic control systems for industrial processes and machinery have offered the public their first issues. One of these is CONTROL ENGINEERING, a McGraw-Hill publication.

What has caused this surge of interest in the design and application of automatic control systems? What does it portend for the future of American industry? More important, what does it promise for the American standard of living, of which industry is and must be the servant? And what is the role of CONTROL ENGINEERING in this development? It is to those questions that this statement is addressed.

A New Intellectual Revolution

It is frequently asserted that we are now in the throes of a new industrial revolution. The revolution is described as the eliminating of wasteful applications of human labor to repetitive tasks through new technology which makes it possible to transfer those tasks to automatically controlled machinery.

It is perhaps more accurate, however, to say that we are the beneficiaries of a new intellectual revolution in the application of science to industry. This new intellectual revolution points the way toward giant strides in the continuing process of taking dull and laborious work off the backs and minds of men and transferring it to machines operating in large batteries under automatic control.

The practical engineering work required to convert this intellectual revolution into a full-scale industrial revolution, however, in large part still remains to be done. It is to this task that CONTROL ENGINEERING will be devoted. Its role is that of bridging the gap, in engineering and economic terms, between the new conceptions of automatic control of industrial processes and their practical workaday application. These conceptions run the full gamut from systems of control for automatic factories making heavy industrial products to highly personalized systems of automatic control to warn people when they are approaching the broiling point in sunning themselves at the beach or becoming too drowsy to drive their cars safely.

Enter the "Feed-Back" System

Enough work has been done to move these conceptions out of the realm of interesting dreams and into the realm of practical possibilities, and in some cases into the realm of practical realities. Crucial parts of this work were done during World War II when weapons were successfully equipped with "feed-back" systems

that automatically corrected mistakes made by the weapons in locating their targets.

The principle of the "feed-back" system is as ancient as the personal monitor that tells us not to run into each other as we walk along the street. It feeds back to our locomotion machinery the warning of a collision ahead. But the application of the principle to weapon control and then to more general machinery control required superlatively imaginative and skillful scientific development.

When a "feed-back" system that monitors an automatic process and keeps it lined up precisely is teamed up with a computing machine, capable of making lightning calculations that control both what goes into the process and what is done with the product, the horizons of automatic control become broad indeed. But in large part they still remain horizons. A vast range of practical engineering work remains to be done to realize anything like the full potential of automatic control of industrial processes and machinery.

More and Better Jobs

There are those who view the surge of interest in automatic control with alarm. They conjure up a situation in which automatic processes will at once expand the ranks of the unemployed and reduce many of those still working in industry to the status of robots or automatons.

A look at the record of the American economy — a record of amazing growth, steadily improving job opportunities and a constantly rising standard of living — demolishes the basis for such fears. The introduction of new and more efficient industrial machinery and processes obviously cannot be accomplished without creating some disturbance for some individuals and some companies. But consistently the longer range effect of such local and temporary disturbance has been more jobs and better jobs for Americans.

It is no accident that, while the proportion of industrial wage earners in our population is virtually the same as it was in 1920, the proportion of professional and salaried workers has doubled. The proportion of unskilled workers, furthermore, has dropped by half. This has been an essential part of a continuing process by which drudgery has been transferred to machines while the workers who formerly did the drudgery have been graduated to jobs calling for greater competence and providing better pay.

Higher Living Standard

A British historian, H. J. Hancock, has referred to this general process as "the Western miracle" — that of providing an ever higher and higher standard of living for more and more Americans. The key element in this miracle has been more and more reliance on power-driven machines to get the day's work done.

In the nature of the extremely complicated apparatus involved, full development of systems which have passed through the "think stage" into the status of practical possibilities will be a time-consuming process. It will also be a very exacting process, calling for a tremendous application of engineering skill and ingenuity. However, the engineers who are concentrating on this difficult, workaday phase of the development of apparatus for automatic control will be inspired by the knowledge that they are making a crucial contribution to technical progress which holds great promise of good for the American people.

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments that are of particular concern to the business and professional community served by our industrial and technical publications.

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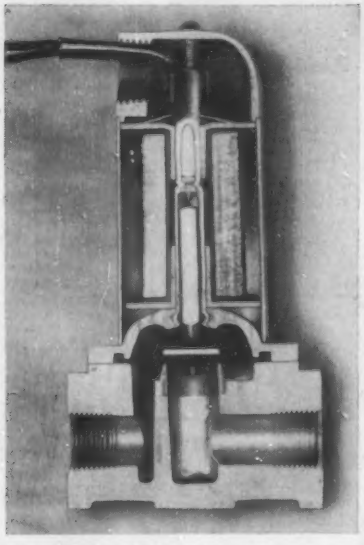
RADIATOR TUBE MILL consists of coil-holding reel, electric brazer and stock reservoir to permit brazing end of coil to be run to the leading end of new coil. Next unit is cold roll forming machine for forming an elliptical lock seam tube with seam on edge, continuous tinning machine, roll straightener and automatic cutoff machine— *Kane & Roach Inc, Syracuse, N Y*



Diaphragm-Operated Solenoid Valves

Eclipse fuel engineering is now producing a complete line of diaphragm operated solenoid valves designed for stand-by control of fluid flow and for automatic cycling operations on machine tools, heat-treating furnaces, foundry machinery, and other metalworking equipment. Units are available in following six pipe sizes: 3/8, 1/2, 3/4, 1, 1¼ and 1½ in. Valves are used for control of air, water, oil, Freon refrigerators, natural, manufactured, propane and butane fuel gases and sulphur dioxide gas. They will operate on line pressures as high as 150 psi and as low as 1/2 in. of water. Ideal cycling range for these valves is from 40 to 60 cpm.

Valves are supplied with aluminum bodies for gas and air service and brass bodies for oil and water service. Valve seats and armature pilot plungers are stainless steel. Operating advantages of the valves are stated as: low power consumption; simplicity of construction; noisless operation, coil interchangeability, high operating efficiency, wide choice of control, maximum shut-off safety and ease of maintenance.

Stock coils are rated at 7 watts maximum. Valve has only two moving parts—solenoid plunger and synthetic rubber diaphragm. Several conventional parts such as valve guides, seat ring gaskets, etc. has been eliminated in the valve. Rim of diaphragm serves as gasket and assures correct alignment of solenoid plunger with valve disk. Shading rings in solenoid plunger and tube assembly prevent alternating current hum and chatter.

Eclipse Fuel Engineering Co, 1011 Buchanan St, Rockford, Ill

Device, called Quikpure, rapidly changes ordinary tap water into the chemical equivalent of triple distilled water. It is comprised of a 16-oz polyethylene squeeze bottle, bottom of which contains a mixture of cation and anion exchange resins. Tap water poured into bottle comes into immediate contact with resins and is converted to distilled water in about one minute. Resins may be used repeatedly up to about 25 gal. of water, depending on hardness.

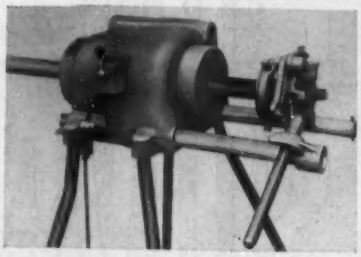
Central Scientific Co, 1700 W Irving Park Road, Chicago, Ill

Grinding Coolant

Triple C coolant for all wet grinding operations may be put directly into water in the grinder where dissolving can take place in as short a time as two minutes. It is compatable with heat-treating salts, makes stable solutions, and maintains properties in hard water. It does not impair filtration equipment operation.

Coolant is foamless, odorless, and does not make ground materials slippery to handle. Solutions have no emulsifying action on oils or other deterrent effect on lubricated parts of machines. Chips are flushed and grinding dust settles rapidly.

Motch & Merryweather Machinery Co, Cutting Tool Manufacturing Div, 1250 E 222nd St, Cleveland 17, Ohio

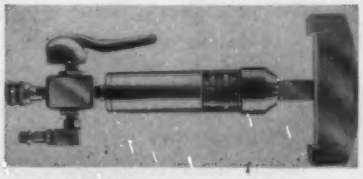


Power Drive Has Automatic Double Chuck

Thred-O-Matic power drive cuts bolts from 3/8 to 1¼ in. and threads pipe or conduit from 1/4 to 2 in., or with universal drive shaft geared tools up to 12 in. Unit develops over two horsepower under load, yet weighs about 100 lb. Only one man is required to operate Thred-O-Matic. Automatic chucking and unchucking is accomplished by flip of switch.

Unit operates on bench, truck, or pipe legs, and any geared die head or hand tools can be used.

Gaines-Collins, Quijada Tool Div, 5474 Alhambra Ave, Los Angeles 32, Calif



Guillotine Unit Straightens Rod Ends

Ends of coil rod are straightened by application of 10-ton hydraulic thrust that will straighten 4-ft lengths in about 16 sec. Unit handles 5/16- to 1 1/16-in.-dia rod.

Hand or foot valve may control straightener, which is powered by 2-hp electric hydraulic pump.

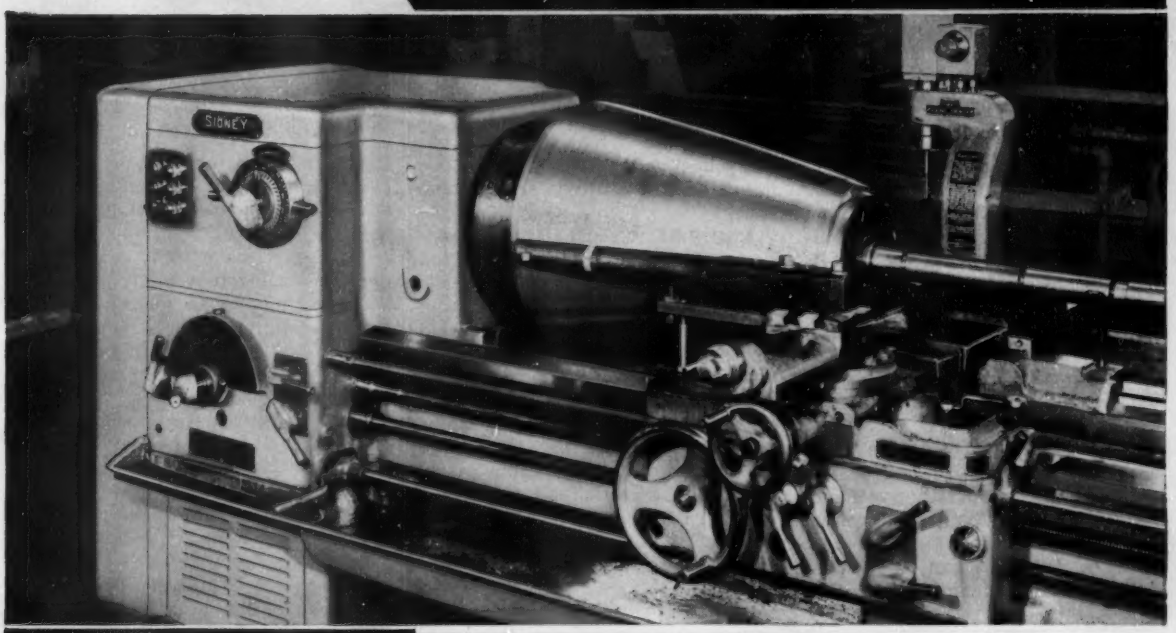
Manco Mfg Co, Bradley, Ill

SIDNEY FLUID TRACER LATHES TAKE THOSE EXTRA BIG JOBS IN THEIR STRIDE

THE MEDART COMPANY

OF ST. LOUIS, MO., IS SHOWN

CONTOUR TURNING THE NOSE OF A GUIDED MISSILE



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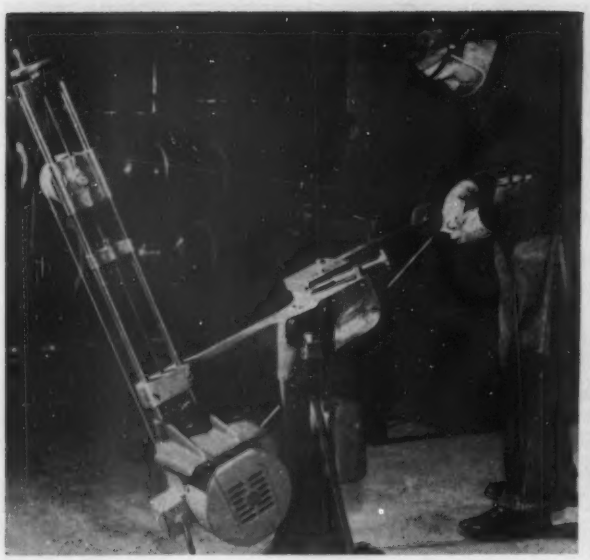
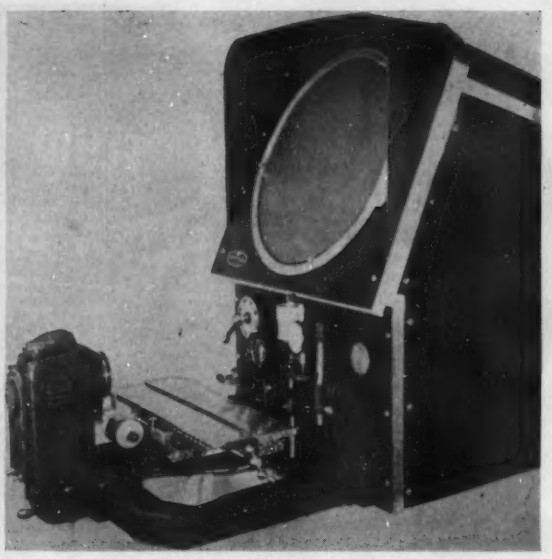




Belt Polishing Machine Has Single Base

Belt polishing machine has contact wheel, idler wheel, and drive motor mounted on single base. Working area freedom — no obstructions around contact wheel — permits polishing of awkward and irregular work. Machine uses standard 132-in. belt with variety of contact wheel sizes. Wheel diameters from 4 to 18 in. can be used on machine without changing surface speeds or belt size.

By mounting all movable parts on one base, operator can change working stance from sitting to standing position. Changing position merely involves loosening one bolt, swinging balanced unit to required height and tightening bolt. Belt tracking and tension are not affected. When installing unit problem of aligning motor drive pulley with contact wheel and idler pulley is eliminated, because all units are on same base.

The unit, termed Bader Space Saver, features a new GE Tri-Clad 8558 totally-enclosed fan-cooled electric motor. Sealed cast-iron housing protects motor from metallic and abrasive dust. Unit differs from conventional polishing jacks because contact wheel is in reality an idler wheel while belt is pulled by motor located at rear of machine. Space saver also permits operator to reverse belt direction at full speed without danger of belt slipping off wheels.

Stephen Bader & Co, Rockville Center, NY

Bench Optical Comparator Has Large Work Area

Horizontal optical comparator, Model L-400, has plain work stage furnished on standard model of 18-in. length. There is a six-inch work space from lens system centerline to plain-stage top working surface. Universal measuring stage is available as an accessory. Universal is 18 in. long, 6 in. wide and provides 6 in. of longitudinal travel. Universal stage also provides traverse movement vertical positioning, and may be set to helix angle either left or right of center.

Comparator features new focal length Portman multi-phase optical system and lenses to provide magnifications ranging from 10 to 100X. High powered light source has variable volume control, is blower cooled and provide uniform illumination over 16-in.-dia image screen. Condenser lens unit in light house is equipped with three color filters and mounting ring.

Accessories available include universal work stage; precision vertical and longitudinal measuring units; graduated rotary screen with vernier scale; and over-lay chart holder. Heavy cabinet base with silent rollers, drawers, and partitions is also available.

Portman Instrument Co, Town Dock Road, New Rochelle, NY

Nordex Plate Cutter Beefed for Extra Strength

The equivalent of 2 in. in extra thickness of steel plate in the throat of Model G is to add sturdiness and reduce vibration. The sheet-metal and plate-cutting machine has an added hand-lever lock for cutting dies and a lever-operated motor switch.

Plate up to 5/32-in. thick and circles up to a diameter of 28½ in. can be cut. Unit will make up to 1500 strokes per min, cut up to 36 ft per min in 16-gage steel, and will bend steel as thick as 14 gage. Mouth opening is 6 in., throat depth 28 in.

Nord International Corp, 449-5 Central Ave, Orange, NJ

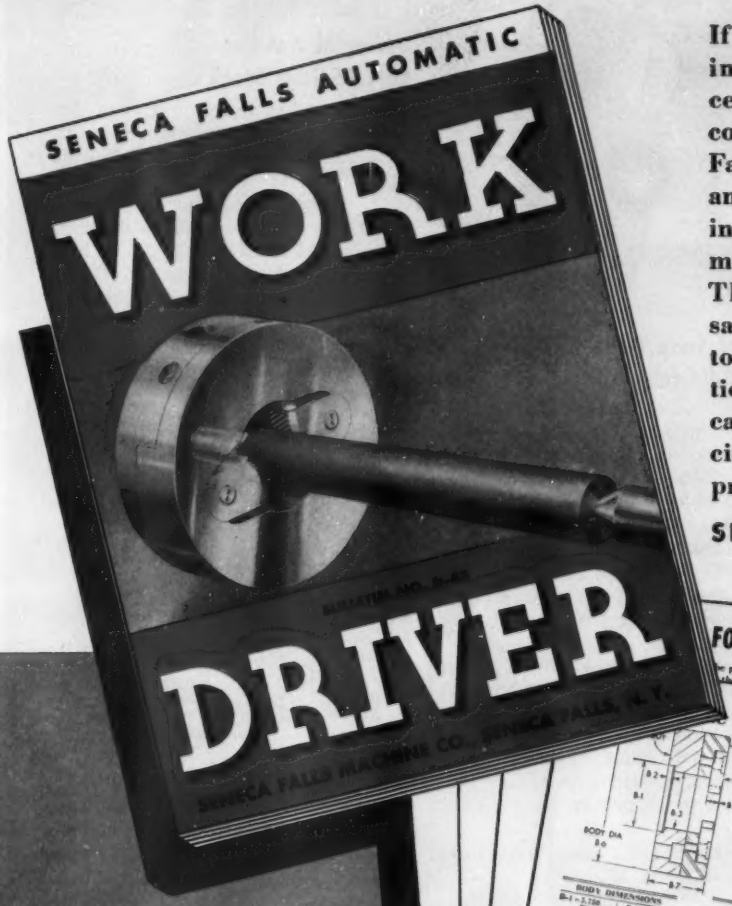
Line of five open-end wrenches, forged to steel tool specifications, are said to have same flexibility, balance, and appearance, with approximately 10% less weight, and a 30% increase in strength, due to the Ampco alloys used in their production.

Ampco Metal, Inc, 1745 South 38th St, Milwaukee 46, Wis

B&W Croloy 9M is a tubing steel for elevated temperature and pressure applications where high corrosion-resistance is desirable. Bulletin TDC 151 provides details.

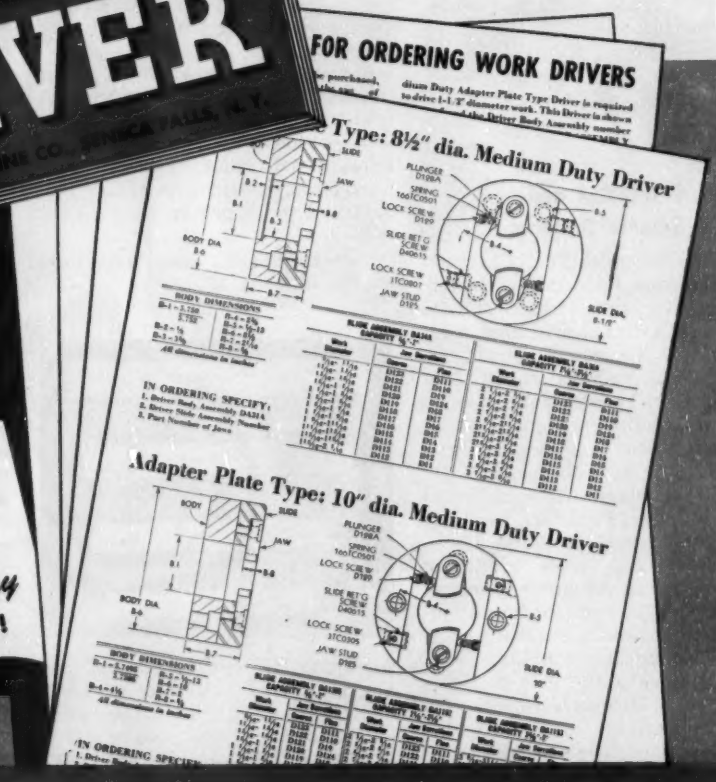
The Babcock & Wilcox Co, Tubular Products Div, Beaver Falls, Pa

This catalog will help you
SPEED UP BETWEEN-CENTERS WORK



If your manufacturing operations involve turning work between centers, write for your copy of this comprehensive catalog of Seneca Falls Work Drivers. It illustrates and provides complete engineering data on eighteen *standardized* models now available from stock. These proven time and labor-savers no longer need be made to individual customer's specifications. You will find a standard unit cataloged that will meet your specific requirements and help speed production.

SENECA FALLS MACHINE CO.
Seneca Falls, N. Y.



TYPICAL PAGES FROM OUR WORK DRIVER BULLETIN

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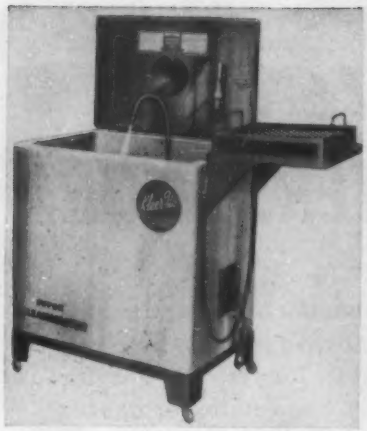
LATHE NEWS *from* SENECA FALLS

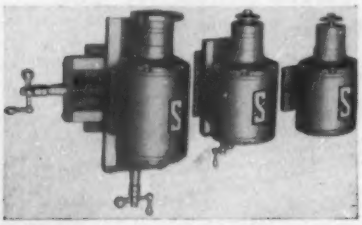


Degreaser Action Spurred By Air Agitation

Model 50 Super Cleanmaster degreaser combines chemical compounds and compressed-air agitation to remove dirt, oil, grease, and chips from metal parts in its soaking tank.

Additional parts are hinged work shelves, parts basket, drying shelf, and air gun to speed drying. Unit is mounted on castors for easy removal to the job. Price is $245.50 fob.

Kleer-Flo Co, Dep't H, 250 W 57th St, New York 19, NY



Motorized Spindles and Vertical Spindle Grinders

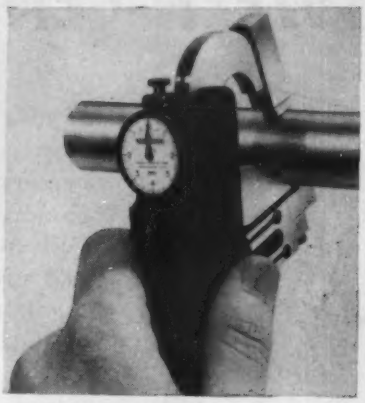
Standard Electrical Tool Company has redesigned their line of motorized spindles and vertical spindle grinders. Illustrated are three models, one with flat mounting pad only, another with vertical hand feed parallel to the spindle, and the third with vertical and horizontal feeds.

Precision bearings, special design of motor with all rotating parts dynamically balanced are incorporated in the redesign. Feeds are available with crank handle or hand wheel, micrometer dial with graduated swivel either on the motor mounting as related to the feeds, or for swiveling the entire assembly. Design permits mounting in any position.

One feature of the new design is optional use of wheels clamped between wheel flanges, or with backing plate for using Type 2 cylinder of plate-mounted cup grinding wheels.

Applications include original equipment manufacturers, for planers, boring mills, or other machine tools. Units are built in sizes ranging from ½ to 25 hp.

The Standard Electrical Tool Co, 2480 W 6th St, Cincinnati 4, Ohio



Federal Snap Gage Now Adjustable

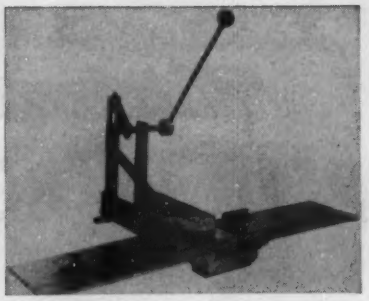
Federal line of single-purpose indicating snap gages now includes two models having adjustable upper contacts. Model 1340 P-20 has capacity of 0.062 to 0.625 in.; 1340 P-21 capacity of 0.625 to 1.250 in.

Both gages are equipped with dial indicators graduated to 0.0001 in. Adjustments are made by sliding reference contact along upper arm of gage.

Movement of sensitive contact is transferred to dial indicator through friction-free integrated pantograph transmission which has no rocker arms or ball cranks. Self-centering backstop is provided to assure that part will be in proper gaging position.

Federal Products Corp, 1144 Eddy St, Providence 1, RI

Armstrong HSS and cobalt-steel toolbits are ground on all four sides with ends bevelled 10°. Both types available in range of twelve sizes from 3/16 to 1¼-in. square — *Armstrong Bros Tool Co, 5200 W Armstrong Ave, Chicago 30, Ill*

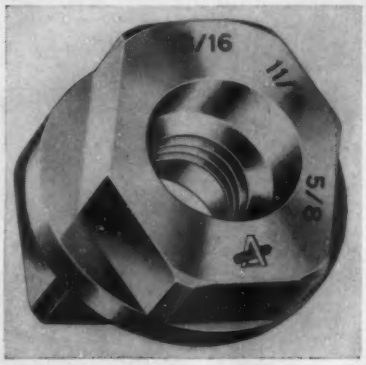


Universal Notcher Cuts 15-Gage Stock

Hand-operated bench unit can develop 2600 lb for cuts spanning up to 3 in., including length and width of 3 in., each to equal a linear 9-in. cut. Corner and angular reliefs, notches and nibbles can be made.

Universal die or angle die of 90°, 60°, 50° or 30° is supplied. Other dies are available at extra cost. Machine weight is 50 lb.

US Tool & Die, Inc, 4 North Main St, Sharpsburg, Pa



Vlier 5-Way Fixture Key

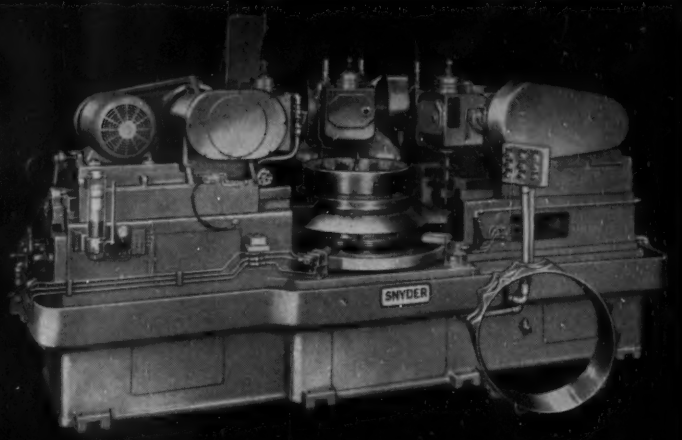
Development of a new fixture key that fits all standard mill table slots from 9/16 to 13/16 in. by 1/16 in. has been announced by Vlier Engineering.

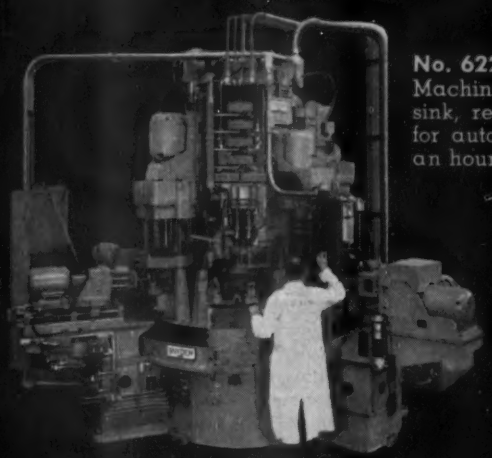
Each of the five tongues on the 5-way key is held parallel and equidistant within +0.0005 in. to shank dia. Actual width of each tongue is held to a +0.000 in.-0.001 in. fit in the mill table slot. Minimum clearance in the slot is 0.0002 in. Supporting sides over the full depth of reamed hole eliminates wobble, assuring alignment and rigidity.

Mounting key to fixture base requires only two holes. Changing key size to fit a different mill table is accomplished by loosening the cap screw and rotating key to new size, permitting fixture to be used on any idle milling machine. Keys can be clamped from either top or bottom.

Vlier Engineering, 4552 Beverly Blvd, Los Angeles 4, Calif

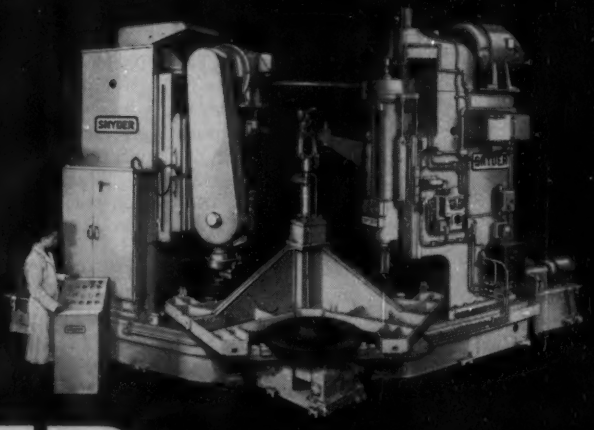
No. 68326—A three-way machine to profile mill four rows of lugs on a compressor casing for jet engines. 135 minutes are used to perform this operation in 3 steps.





No. 62207—Six Station Center Column Machine to drill, counterbore, countersink, ream and tap converter housing for automatic transmissions. 91 pieces an hour at 80% efficiency.

No. 67677—Two-Station, Vertical Column, Boring and Facing Machine to rough bore and face the hub of heavy railroad car wheels. Bore 6¾" x 7" long. 33 units an hour at 100% efficiency.



SPECIALS by

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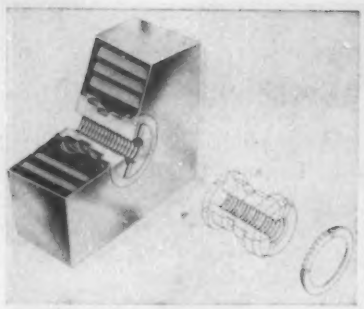
TOOL & ENGINEERING COMPANY

3400 E. Lafayette, Detroit 7, Michigan

29 Years of Successful Cooperation with Leading American Industries

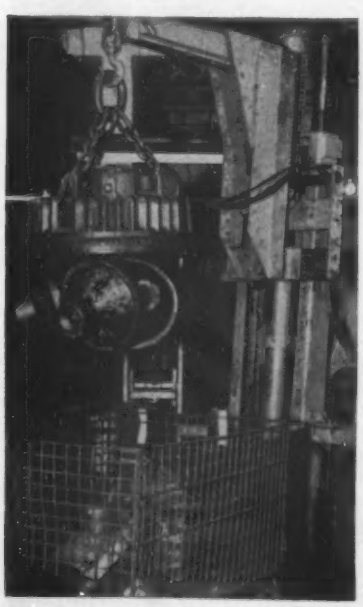


Self-Locking Insert

Kwiko self-locking insert for use in fastening objects to sandwich structures is a two-piece item said to be quickly and easily installed without special tools. It is manufactured in a variety of sizes and materials, is light in weight.

Unit is a threaded insert with a self-contained locking feature. Body of insert is placed in hole in sandwich structure, and grommet ring snapped into position on outer sheet of structure. Screw-driver slots in face of insert prevent rotation of insert when bolt is being installed. Insert is designed in series—SL24 for use with ordinary AN bolts and SL25 for use with 100° countersunk head bolts.

Shur Lok Corp, 9010 Bellanca Ave, Los Angeles 45, Calif



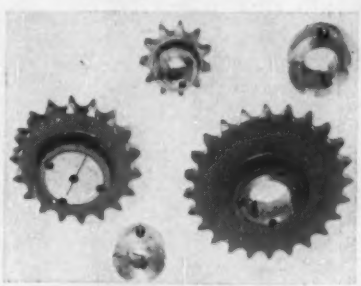
Electro-Magnets for Use With Industrial Trucks

Line of small electro magnets were designed to be used with mobile material handling systems. They can be used with boom-equipped gas or electric industrial trucks and in some applications magnets can be attached directly to forks of lift trucks.

Magnets will lift coiled stock, castings, billets, pipe, slabs and batches of small parts as well as loose scrap. Accurate positioning of machine stock or large castings on machine tools or grinders can be accomplished, and handling of large dies for molding machines is simplified. Manual handling of hot castings or forgings can be eliminated.

When not in use magnets can be utilized as floor sweepers for ferrous scrap. Magnet is lowered to within 1 or 2 in. of floor. Units are furnished in sizes ranging from 12½ to 36 in. in dia and weighing from 155 to 1900 lb. While larger size units are available for use on heavier duty industrial cranes, smaller magnets are recommended for intermediate duty.

Electric Controller and Manufacturing Co, 2781—79th St, Cleveland 4, Ohio



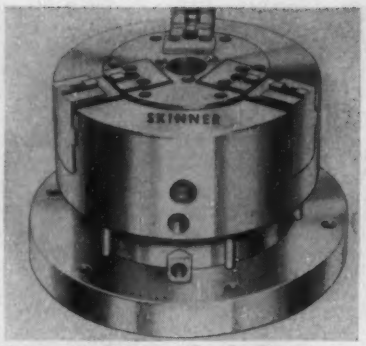
Expanded Line of Roller Chain Sprocket

Morse Taper-Lock roller chain sprockets in both single and double hub types are available in expanded line of stock sizes for 1½, 1 3/4 and 2-in. pitch chain. Sprockets in the new sizes up to 26 teeth are approximately 0.40 carbon steel and can be flame-hardened to customer order. Only five bushing sizes are required to fit the newly-expanded line. They are being stocked by Morse distributors in 54 bore sizes fitting shafts from 1 5/16 to 3 1/2-in. dia in the No. 120 sizes, from 1 5/16 to 4-in. dia in the No. 140 sizes and from 1 5/16 to 4 1/2-in. dia in the No. 160 sizes (1½, 1¾, and 2 in. pitch).

Morse Chain Co, 7601 Central Ave, Detroit 10, Mich

Model No. 12-H-802 magnesium hand truck is rated to handle loads up to 450 lb, yet weighs only 16 lb when equipped with rubber-tired magnesium wheels. Unit, with a shovel-designed nose 12 in. long, is specifically designed for facility in moving bulky packages and cartons.

Magline Inc, 1950 Mercer St, Pinconning, Mich



Compact Power Chuck Fixture For Variety of Applications

Skinner power chuck fixture is non-rotating, air-operated, self-centering. It is said to have unusual gripping power due to its wedge action.

Angle of the operating wedge prevents chuck from releasing the work, even though airline is broken, making it particularly adaptable for operations on transfer machines. Unit can be disconnected from the airline and transferred to another machine for a different type of operation or different kind of machining on work. Disconnecting is accomplished by means of quick-detachable couplers.

Available in 8, 10, or 12-in. dia, with two or three jaws; adjustable jaws can be furnished for holding irregularly-shaped parts. Can be operated with either a Skinner hand valve, solenoid, or a 4-way foot valve. Maximum air pressure is 100 lb. Details provided in Bulletin PCF67.

Skinner Chuck Co, New Britain, Conn

Quick Connector Locks Electrode Holder

Whips, whip ends or any mechanical or solder holder connections are eliminated by a built-in cable connector on Cam-Lok electrode holders. Any cable can be connected to the holder by adding a Cam-Lok female connector.

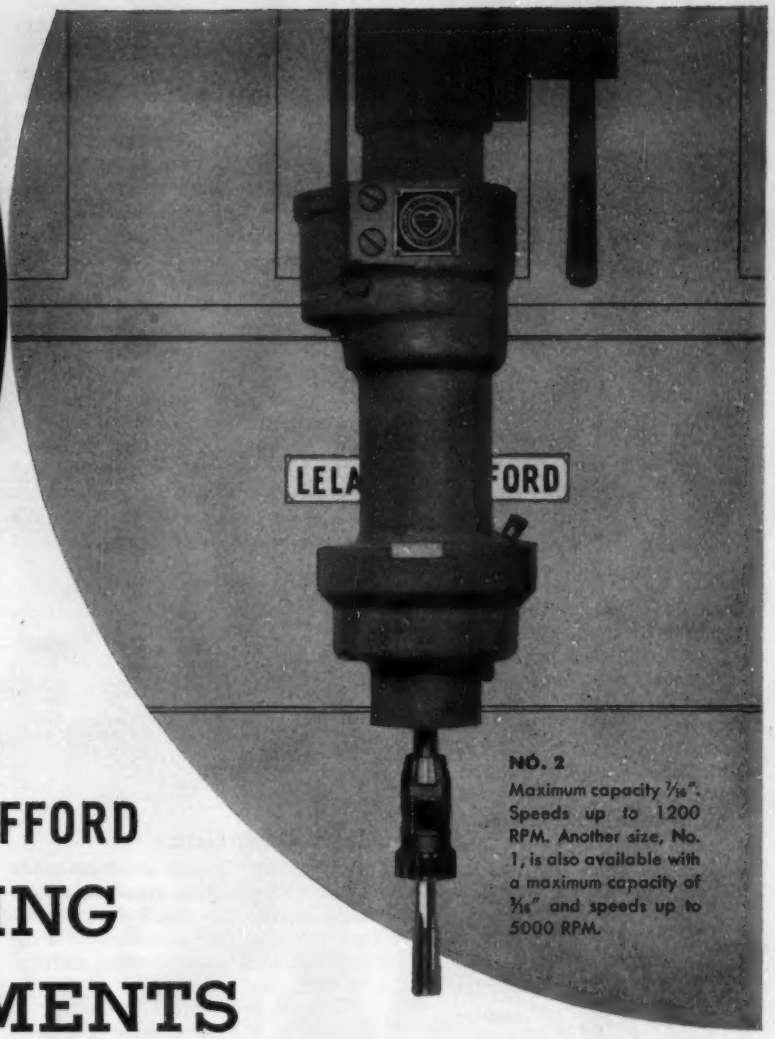
Pug-nose and straight-nose units are available with a double cam design that produces positive, vibration-proof connection. Holders have light fiberglas construction, interchangeable jaw pads, and simple, easily-cleaned design.

Cam-Lok Div, Empire Products, Inc, Box 98E3, Cincinnati 36, Ohio

turn potential into profit...

with

LELAND-GIFFORD TAPPING ATTACHMENTS



NO. 2
Maximum capacity 7/16". Speeds up to 1200 RPM. Another size, No. 1, is also available with a maximum capacity of 5/16" and speeds up to 5000 RPM.

Use all the speed, precision and efficiency of your Leland-Gifford Drilling Machines in tapping, too — simply by fitting on a Leland-Gifford tapping attachment.

The operator controls the tapping attachment from the feed lever of the machine — exactly as in drilling. He can thus maintain sensitive, fingertip control at all times — greatly increasing production, tapping to depth with great accuracy and practically eliminating the chance of tap breakage.

Leland-Gifford Tapping Attachments will handle class 3 holes with ease. They attach rigidly to the quill and may be instantly stopped or reversed at any time. Full ball bearing assembly assures smooth operation. Reversal is exceptionally smooth due to the friction of steel acting against Textolite*.

Order one today or write for Bulletin 510-B.

*Plastic impregnated cloth

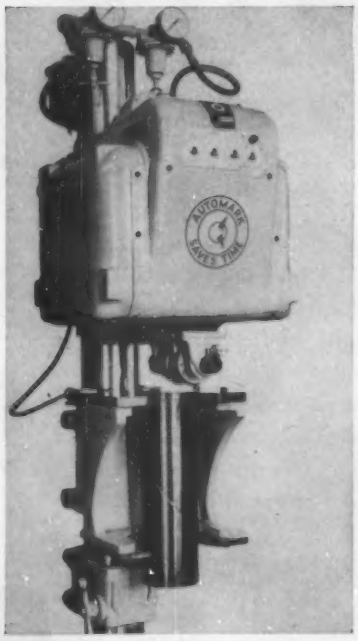
LELAND-GIFFORD
Drilling Machines
WORCESTER 1, MASSACHUSETTS, U.S.A.

- **CHICAGO 45**
  2515 West Peterson Ave.
- **DETROIT**
  10429 West McNichols Rd.
- **CLEVELAND 21**
  P. O. Box 217
- **NEW YORK OFFICE**
  75 South Orange Ave.
  South Orange, N. J.
- **LOS ANGELES OFFICE**
  2620 Leonis Blvd., Vernon 58, Cal.
- **INDIANAPOLIS 6**
  P. O. Box 1051
- **ROCHESTER 18**
  P. O. Box 67, Rosslawn Station

Five-Pound Balancer Supports Portable Tools

Model 7472, weighs 2 lb, has all adjustments on the outside and features cable sheathed with nylon. Take-up adjustments are a spring lever to relieve tension or a tightening nut to increase tension. Unit has cable stop for adjusting length of travel, and is furnished with 5 ft of cable. Rust-resisting housing has flat profile.

Aro Equipment Corp, Bryan, Ohio



Automatic Roll Marker Develops 7500 Psi

Automark Model RMA-1 is air-powered and electrically controlled to make up to 6000 impressions per hour with either a rolling or flat stamp. Marking head and table can be moved up and down or rotated on the column to accommodate large or unusually shaped parts. In place of the table a large fixture face may be mounted to the table clamp on the column.

Round stamp or wheel is automatically rolled across flat surfaces. Flat stamp is used for round surfaces. An accessory allows repeat rolling to give greater indentation. Floor space required is about 4 sq ft and weight is 850 lb. Table is 8x10 in. and distance from center of die slide to collar is 7 in. Maximum height from die slide to base is 48½ in.

Automatic feed fixtures such as dials and slides chute feeds and motorized hoppers can be attached and operated by remote control.

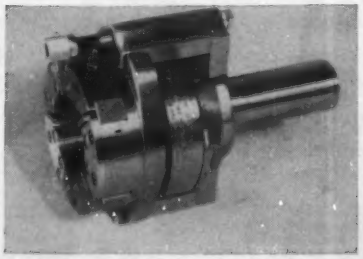
Defiance Machine and Tool Co, 920 S Vandeventer Ave, St Louis 10, Mo

Smith Collet Fixture

Smith collet fixture, precision-made to fit many existing standard collets from 1/16 to 1-in. dia, is designed for use in secondary operations of drilling, tapping, counterboring, milling, slotting, and reaming.

Fixture is mounted by bolting to face plate of a lathe, table of a drill-press, or bed of a milling machine. Accuracy is attained for hexagon and square parts as well as rounds. Standard and right-angle models available in price range from $33 to $53.

Smith Sales Co, 193-16 99th Ave, Hollis, NY



Insert-Chaser Die Head

Light-duty 11005 DM H&G insert-chaser die head is for use on No. 2 Brown & Sharpe automatics with 1½-in. capacity spindles and for thread sizes ranging from 1⅛ to 1½ in. with pitches not coarser than 18 TPI. Price of die head including five carriers is $200. Chaser prices are the same as for special ones for the 108-size die head.

Also available are size 152 style MM automatic H&G insert chaser die heads. These have a capacity ranging from ¼ in. to 1¼ in. OD and carry five chasers and carriers. Price of die head including a set of carriers is $175, and extra carriers are $40 for a set of five.

Eastern Machine Screw Corp, New Haven 6, Conn

Dual-Purpose Bandsaw Works Flat or Upright

Bandsaw head on Model 49A may be swung horizontal or vertical for use as cut-off saw or as upright bandsaw for cutting slots, angles, bevels, notches, or contours. Capacity is 3½-x 6-in. rectangular stock, or 3½-in. OD rounds.

Blade is ½ in. x 0.025 in. x 5 ft and is driven by ¼-hp. 115-volt motor with automatic shutoff at end of each cut. V-belt drive with speeds of 54, 100, and 190 fpm, and positive-clamping screw vise are features. Idler and drive wheels run on greased, sealed, ball bearings.

Unit has 6½x24-in. bed, 24 in. high. Net weight is about 110 lb.

Wells Mfg Corp, 505 Roosevelt Rd, Three Rivers, Mich

Sealing Tape

No. 579.6 sealing tape, extruded in ribbons or beads, is said to have excellent pressure-sensitive adhesion to most materials. Tacky, fibrous mastic protects metals from corrosion, water and dust, will not swell rubber parts, is non-staining and non-bleeding, and remains permanently soft. Reportedly will not flow at 300 F and will not harden at —65 F.

Presstite Engineering Co, 3798 Chouteau Ave, St Louis 10, Mo

NO PLACE TO GO BARGAIN HUNTING!

You miss the BIG savings of Correct Lubrication when you set your sights on price alone!

SOCONY-VACUUM

SOCONY-VACUUM

Correct Lubrication

First Step in Cutting Costs

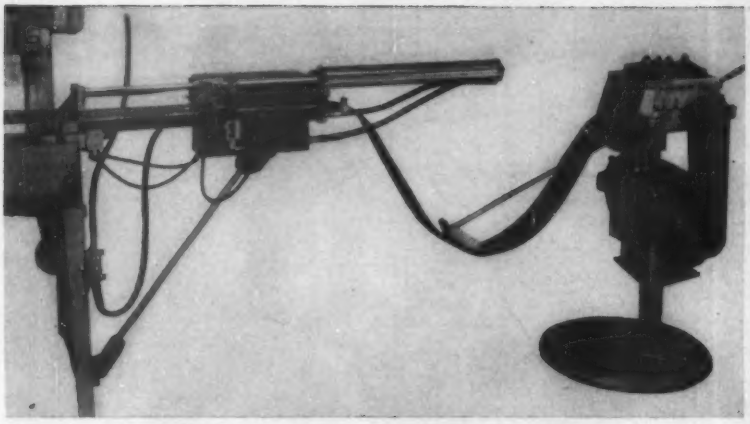
If you're aiming at lower costs in your plant, you won't automatically bag a bargain by buying low-priced oil and grease. Fact is, the few pennies you save on initial cost may prove mighty expensive.

The productive efficiency of your machines—how long they last—cost of maintenance...all this literally may rest on just a thin film of oil. You can't take chances with this vital film—you need *Socony-Vacuum* quality!

But this top quality is only part of the Socony-Vacuum story. We also work with your plant personnel to analyze your machines, recommend the right products, set up lubrication schedules, give you progress reports on benefits achieved.

In thousands of plants such a program of Correct Lubrication has improved production—significantly cut unit costs. Can you afford to accept anything less?

SOCONY-VACUUM OIL COMPANY, INC., and Affiliates: MAGNOLIA PETROLEUM COMPANY, GENERAL PETROLEUM CORPORATION



Air-Operated Slide Feed Has Open Throat Design

Air-operated press slide feed has an open throat that will feed stock in any width, as well as wire and tubing. Air operation is said to permit extreme accuracy of feed, quiet operation with no shock, faster setup in any position, and interchangeability from one press to another.

Unit has a positive stock control clamp, single motion gripping action, simple screw adjustment to control rate of feed, and a self-contained hydraulic cushion. Operates on standard shop airline pressures.

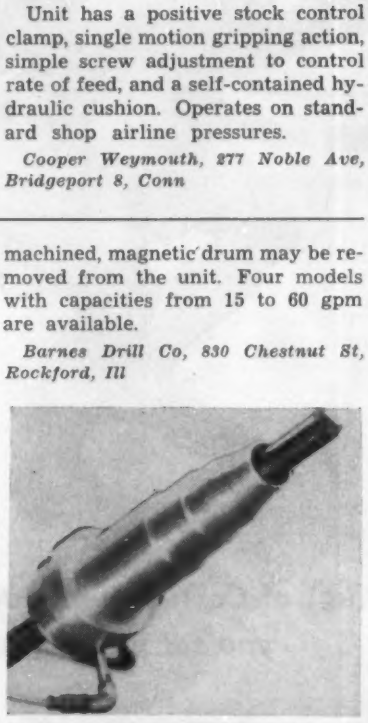
Cooper Weymouth, 277 Noble Ave, Bridgeport 8, Conn

Combined Coolant Cleaner Uses Magnet and Fabric

Kleenall unit has a flow channel surrounding a rotating magnetic drum to take out ferrous metal particles and entrained abrasives. Coolant then flows to filtering area forming a pool on a supported fabric apron that removes the remainder of abrasives and dirt. Coolant pool may be as deep as 5 in., promoting faster filter flow.

Expendable fabric filters of various densities are available. Swarf collected by scraping it off the magnetic drum, the used fabric, and the swarf it has trapped are all deposited in a sludge pan for easy removal. When non-ferrous metals are being machined, magnetic drum may be removed from the unit. Four models with capacities from 15 to 60 gpm are available.

Barnes Drill Co, 830 Chestnut St, Rockford, Ill

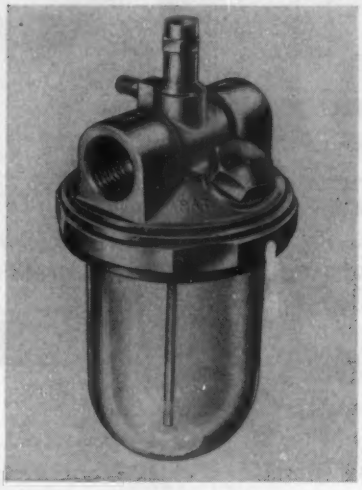


Automatic Sizing Mandrel Has Dual Applications

Automatic sizing mandrel, for use on all Sunnen models and other makes of horizontal honing machines, is a pneumatic honing and measuring device said to incorporate all of the advantages of air gaging. Can be used either for manual honing applications or, in combination with an automatic stroking attachment, to provide a completely automatic honing and sizing unit.

Accuracy on a production basis is ±0.0001. Advantages include: direct gaging of part during honing; positive control of taper and bell-mouth condition; elimination of oversize parts, and reduction of inspection costs.

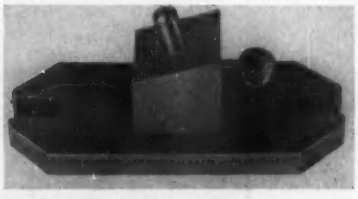
National Pioneer, Inc, 1134 Nebraska Ave, Toledo 7, Ohio



Air-Line Lubricators Calibrated for Flow

Oil mist is injected into compressed-air stream to lubricate air cylinders and air devices by lubricators made in ¼-in., ⅜-in., and ½-in. pipe sizes. Units have four special features: They will operate on very small intermittent air flows as for smaller cylinders; at shutdown, air escapes but oil is trapped and will not flood the line; micrometer oil-metering adjustment is calibrated at factory and any required oil flow can be instantly duplicated by setting a number dial; unit will operate with air flow in either direction without any change.

Generant Engineering Co, 260 South 20th St, Newark 3, NJ



Simple Diamond Holder For Surface Grinders

Diamond-nib holder, D-H No. 15, brings tip into contact with wheel at 15° angle. Thumbscrew allows rotating holder by hand for wear. Solid steel base weighs 2½ lb, and may be either bolted or held to the table by a magnetic chuck. Any size diamond holder may be clamped.

Desmond-Stephan Mfg Co, Urbana, Ohio

What shape is a quality fastener?

Here is a handful of ELASTIC STOP® nuts. Each has ESNA's familiar red locking collar . . . is self-locking and vibration-proof. Each is a readily assembled, one-piece unit. Each provides positive protection against thread corrosion . . . prevents liquid seepage along bolts. Each is made from the finest of raw materials. Each is exactly controlled as to finished dimensions, class of thread fit and finish. Each is now in use on critical applications, with a record for uniform high quality that is unmatched.

Most of them are standard parts. Some originated as the result of a specific request for ESNA's help with an important fastening problem.

Isn't it logical to call on us with your next fastening problem?

ELASTIC STOP NUT CORPORATION OF AMERICA

ESNA TRADE MARK

ROLLPIN TRADEMARK

Elastic Stop Nut Corporation of America
Dept. N62-99, 2330 Vauxhall Road, Union, N. J.

Please send the following free fastening information:

☐ **ELASTIC STOP nut bulletin**

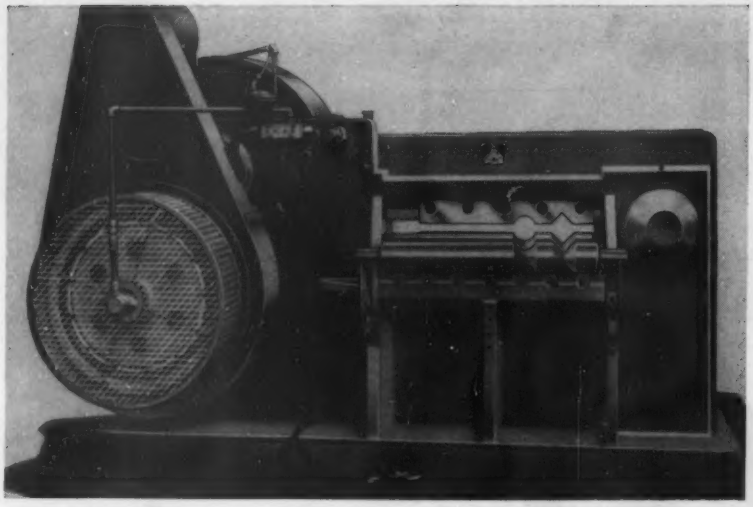
☐ **Here is a drawing of our product. What self-locking fastener would you suggest?**

Name_____ **Title**_____

Firm_____

Street_____

City_____ **Zone**_____ **State**_____



Shear Mounts 36-in. Knives

Rounds, squares, flats, angles, channels, I-beams, and special shapes are cut by lever-operated shear that mounts 36-in. knives. For smaller work, 10½-in. blades may be more easily and quickly installed and changed.

Lever arm is cast steel and bed is heavy welded steel plate. Patented knife-seat construction permits quick, accurate blade setting without use of shims. Shear uses many standard Canton Alligator shear parts and standard air-clutch unit on Canton stop-motion shears. Mechanical advantage for cutting is 5:1.

Hill Acme Co, Canton Div, 1201 West 65th St, Cleveland 2

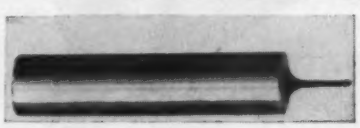
Self-Releasing Collets

Line of self-releasing collets with a clover-leaf grind is designed so that operator can release the collet and work automatically, without the usual method of pumping the drawbar fore release.

Units have positive, live spring tension; open wider for any given size work, and require no gage fitting for secondary operations. Wiping contact between collet and closing sleeve is produced with the opening action of collet, eliminating possible error due to chips or dirt entering between collet and sleeve.

Available in styles, 5C, 3C, 3AT, and 6AT, in sizes from 1/64 to maximum capacity.

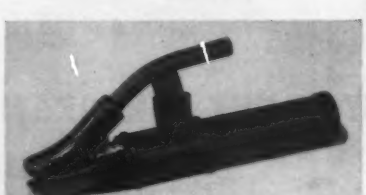
Royal Products, 88 Union St, Mineola, LI, NY



Boring Tools

Line of short-necked boring tools has been designed especially to facilitate boring of precision holes. Neck length of tools is slightly longer than boring depth to achieve maximum rigidity. There are 25 sizes in each of the Bokum styles—Style A for through boring and Style B for bottoming. Tools are available in both HSS and carbide-tipped models.

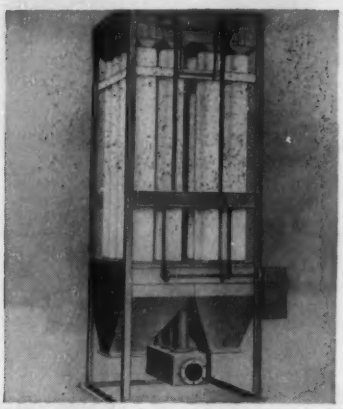
Bokum Tool Co, Detroit 38, Mich



Molded-Glass Handle on Electrode Holder

Caddy Cub Type B-20 electrode holder is rated at 300 amps and weighs only 14 oz. Key feature is handle of molded glass-fiber-reinforced plastic. Holder body is lightweight stamped steel. Jaw is beryllium copper, and connection to jaw is welded copper. Unit will operate 1/16 to 3/16 in. electrodes continuously and ¼ in. intermittently.

Erico Products, Inc, 2070 E 61st Place, Cleveland 3



AMERjet Dust Collector For Fine Particles

AMERjet dust collector is a reverse-jet fabric collector designed for applications where extremely fine particles are involved or where material must be collected in a dry state for reclaiming.

Cleaning media is automatically reconditioned by jet of high-pressure air forced through cloth in opposite direction to flow of air being cleaned. Cleaning cycle is continuous and unit maintains constant pressure drop. Method also permits much higher velocities through the cleaning tubes and less filter cloth is needed.

American Filter Co, Inc, Louisville, Ky

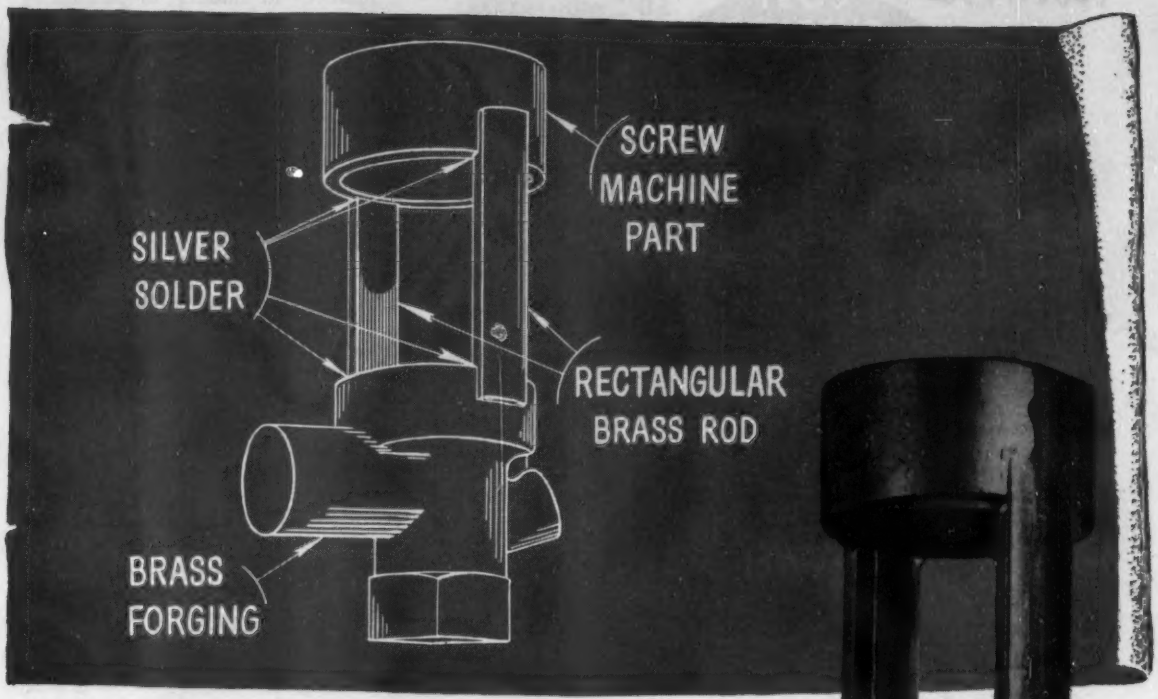
Turret-Lathe Stop Holds to 0.001 Inch

Spring-loaded stop will fit on any turret lathe having multiple stop roll. Unit is made of case-hardened steel and chrome plated, and is only 4½ in. long.

Stop helps to kick off power and hand feed into readable dimensions. Best results are obtained when used with a tenth indicator having a half inch of travel.

One Thousandth Stop Co, PO Box 2217, Van Nuys, Calif

REVERE Brass Forging



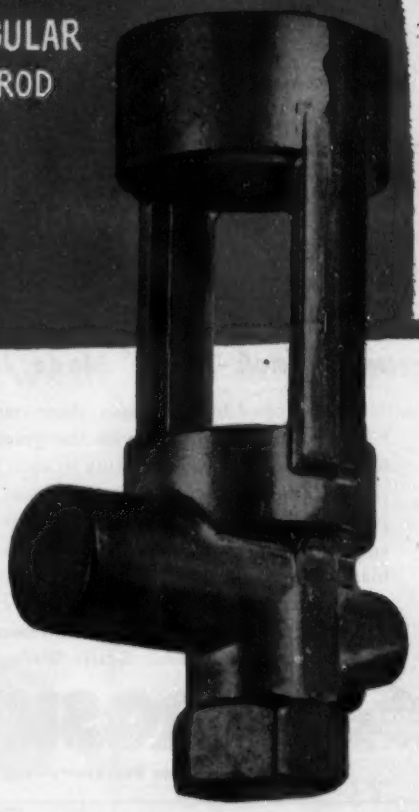
MAKES 1 PART OUT OF FOUR

. . . saves money

The one-piece brass forging shown here replaces a built-up part, formerly made of a screw-machine part, a forging, and two rectangular bars, assembled by four silver-soldered joints. The latter in turn replaced an iron casting, which was more expensive than expected, due to rejects. The part goes into a visible force-feed lubricator, which can operate at several thousand psi., and can be controlled to feed just a drop at just the right time to such equipment as compressors.

We suggest you look into forgings of copper, brass, other copper alloys, aluminum alloys. The forging process produces parts that are dense, non-porous, have many design details accurately and smoothly executed, require a minimum of machining. Revere knows a great deal about the forging of non-ferrous metals. In the case shown here, we collaborated closely with the customer in designing the part so it could be forged in one piece instead of being assembled out of four different items. The result is a better part, and appreciable economies.

For information about forgings, see the nearest Revere Sales Office.



Partially-machined brass forging for sight feed of force-feed lubricator.

At top, drawing showing how this part formerly was assembled out of four different pieces.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N.Y.

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.— Sales Offices in Principal Cities, Distributors Everywhere.

SEE "MEET THE PRESS" ON NBC TELEVISION, SUNDAYS

McCROSKY

1904-1954 COST CUTTING TOOLS 50TH ANNIVERSARY

3/8" - 7/16" - 1/2" and 5/8"

THIN SLOTTING CUTTERS

4" — 5" — 6" — 8" — 10" and 12" in diameter

with Jack-Lock® blade locking wedges

• Developed by McCrosky, these new cutters combine the rigidity of solid slotters with the greater economy — longer life — the easy, positive locking of each blade — and the quick release and accurate blade adjustment of McCrosky's shop-proved Jack-Lock Wedge. Locking pressure of the wedges against the alternate right and left hand milled and ground blades is parallel to the sides of the cutter, avoiding any side stress, warping or misalignment. Easily converted into half side cutters by simply inserting blades all of one hand. New bulletin gives dimensions and full details. *Write for Bulletin 17-M today.*

McCROSKY TOOL CORPORATION
MEADVILLE, PA.

Engineering and Sales Representatives in the Principal Cities

Jack-Lock® MILLING CUTTERS	3" to 24" in diameter.
Universal MILLING CUTTERS	Up to four times as many blades as the cutter diameter.
Super® Adjustable REAMERS	15/16" to 6" in diameter.
Wizard® QUICK CHANGE CHUCKS	Change drilling tools without stopping the spindle.
Turret TOOL POSTS	Gives engine lathes the versatility of turret lathes.
Block Type BORING BARS	Centering V-key locks cutter block accurately and rigidly
Multiple Operation TOOLS	Combine related operations speeding production and cutting costs.

Oakite Pickle Control No. 5 is a liquid inhibitor for sulphuric, hydrochloric, or phosphoric acid, or mixtures thereof. It provides a controlled foam blanket on pickling solutions in addition to performing its inhibiting function. Applicable to batch pickling operations because of ease of making additions.

Oakite Products, Inc, 124 Rector St, New York 6, NY

No. 161.1 moldable, flexible sealing tape or bead with a string reinforcement core, is available in tape form. Reportedly has excellent adhesion on both sides, making it particularly adaptable for sealing under metal trim, between aluminum lap joints, under metal flanges, and for setting and sealing glass in metal frames or channels. Black sealer retains its shape and softness from —30 F to 200 F.

Presstite Engineering Co, 3798 Chouteau Ave, St Louis 10, Mo

Synchronous motor, designated Type KX, will deliver 30 in. oz of torque at 1 rpm. Available in a wide range of speeds from 60 rpm to 1 rpd for either right, left, or oscillating rotation. Precision-cut, no-back gears control direction of rotation. One- or two-way friction, permitting shaft to be turned independently of motor or gearing, can be supplied. Also available with standard clutch, reverse clutch, and in dual motor designs.

R W Cramer Co, Centerbrook, Conn

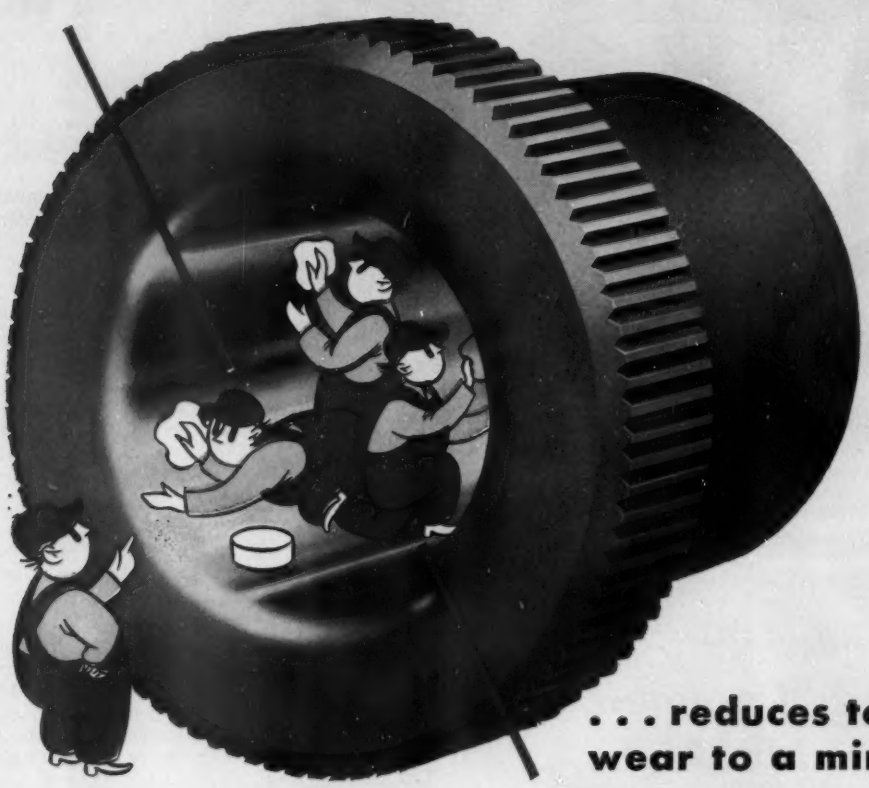
Chicago-Latrobe Harduty drills are manufactured with high-speed steel bodies and with heavy-duty carbide tipped point. Designed to drill accurate holes in hardened die steel heat-treated to Rockwell C-40 to C-65. Available as regulars in size range from 1/16 through 3/4 in. in increments of 1/32-in. dia. Also available in sets containing sizes 1/8, 3/16, 1/4, 5/16, 3/8, and 1/2 in.

Chicago-Latrobe, 411 W Ontario St, Chicago 10, Ill.

Rack and lid combination, called Hopper Rack, converts standard Nes-Tier materials handling boxes into small parts hoppers for use in assembly and production operations. Full box is converted into a hopper by means of a combination lid and tray that fits under handles and snaps into place. As soon as lid is attached, box is hung on hopper rack which supports it a 45° angle. Racks can be bench- or wall-mounted.

Wm Doepke Mfg Co, NesTier Div, 8813 Blue Ash Road, Rossmoyne, Ohio

SUPER FINISH OF UNIVERSAL DRILL BUSHINGS . . .



. . . reduces tool wear to a minimum

One sure way to cut excessive tool wear in your operations is to specify Universal Drill Bushings because their superfinish bores help reduce wear on production tools to an absolute minimum, especially in close tolerance work. The blended radius on the top inside diameter helps prevent tool hang-up and breakage. 100% concentricity and hardness tests insure accuracy, uniform high quality and long life. Knurled heads provide a quick, sure grip. Universal Drill Bushings are produced in a complete range of standard sizes and lengths. Orders for special dimensions will receive prompt attention. For complete information, write to the office nearest you—Universal Engineering Sales Co., 1060 Broad St., Newark 2, N.J.; 5035 Sixth Ave., Kenosha, Wis.—or our home office.

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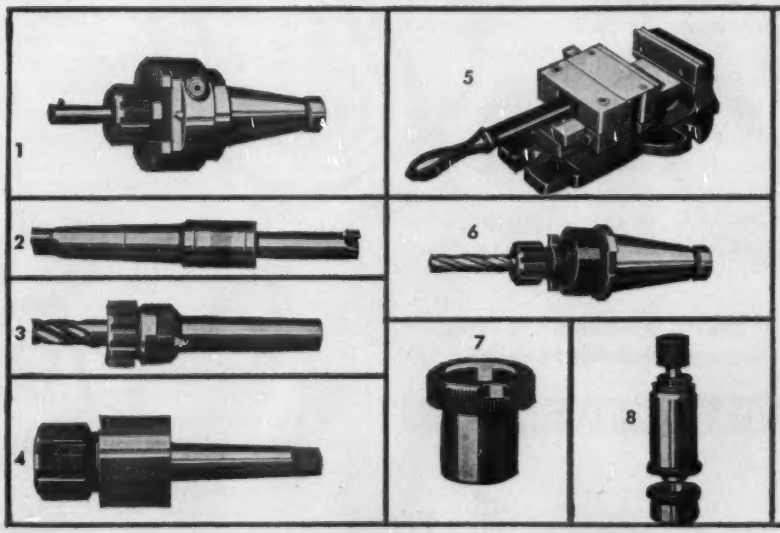


UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH 1 MICHIGAN

(1) BORING CHUCK
(2) MIKRO-LOK BORING BAR
(3) STANDARD COLLET CHUCK
(4) FLOATING COLLET CHUCK
(5) WEDGE-LOCK PRODUCTION VISE
(6) "KWIK-SWITCH" TOOL HOLDER
(7) STANDARD DRILL BUSHING
(8) UNIVERSAL INDEX PLUNGER

Lets see if "Commercial" PRESSED METAL STAMPINGS will reduce your cost...

Greater consumer appeal of this rotary lawn mower really paid off when the platform housing became a "Commercial" specialized steel stamping. Engineering improved the product because redesigning by "Commercial" made it lighter and more compact, thereby lengthening its life service and increasing its efficiency. Savings in cost were accomplished in so many ways, as usually is the case when a specialized stamping goes into a final assembly. Breakage is eliminated, there is a substantial reduction of the amount of metal used, several subsequent machining operations are not required, and the surface of the stamping is ready without finishing for painting.

You may well investigate the many opportunities for production economies and improvement of your product by seeing if the developed skills, working with modern tools and equipment, at "Commercial" can do it better with a specialized steel stamping. "Commercial" are stamping specialists who produce a lot of unusual stampings. We will be glad to assist in your design.

"COMMERCIAL"
"PRODUCTS PREFERRED BY CUSTOMER ACCEPTANCE"

THE COMMERCIAL SHEARING AND STAMPING COMPANY
Youngstown, Ohio • Chicago, Illinois • Salt Lake City, Utah

STAMPINGS • FORGINGS • TANK HEADS

PA-1

Complete line of carbide-tipped combination ream C'bore and facing tools that will form the standard female fitting specified in the AND 10050 design standard has been introduced. Tool is manufactured in two styles, one for turret lathe or screw machine use, and one for drillpress. Data sheet available.

Wetmore Tool & Engineering Co, 5320 East Washington Blvd, Los Angeles 22, Calif

Barrel-handling attachment available on all Raymond Reach-Fork trucks, makes it possible to stack barrels from aisles only 6 ft wide. Loads of up to 1000 lb can be multiple-stacked, tight together, from very narrow aisles and in confined areas. Grab attachment is readily interchangeable with standard elevating forks for pallet stacking, and can also be furnished on the firm's line of narrow aisle straddle trucks.

The Raymond Corp, 57-124 Madison St, Greene, NY

Hermetically sealed limit switch is designed for high resistance to extreme heat and sub-zero cold; is said to remain operative when completely immersed in water or coated with ice. Unit consists of a standard basic switch protected by a durable, sealed housing with integrally mounted actuator. Variety of actuators are available to fit specific applications. Electrical rating is 10 amp at 125/250 v, dc, or 10 amp at 28 v, dc, inductive.

Electro-Snap Switch & Mfg Co, 4218-30 W Lake St, Chicago, Ill

Set of speed bits is available in ⅝, ¾, ⅞, and 1-in. sizes, so designed that only one shank is needed for all. Tool is shaped so that it cuts freely, and double curve helps expel chips, reducing and usually eliminating clogging. Set sells for $2.50; extra shanks and blades available. Six and 12-in. extensions are also available.

Edw L Sibley Mfg Co, Inc, Bennington, Vt

Sullvyne-Clad metal laminate is a material formed from bonding vinyl plastic on metal sheeting — steel, aluminum, magnesium, or copper. It is then post-formed into the finished product. It may be bent, drawn, stamped, crimped, or punched without destroying either the vinyl or its bond. Plastic layer is said to form the protective coating ten times quicker than any conventional finish, is extremely resistant to abrasion and corrosion.

Metal Laminate Div, O'Sullivan Rubber Corp, Winchester, Va

STYROGRIP, a transparent adhesive for bonding Styrofoam, does not disturb or collapse the Styrofoam structure. Qualities include rapid drying and an exceptionally fast grab which allows swift assembly. Applied either by brush or squeeze bottle.

Adhesive Products Corp, 1660 Boone Ave, New York 60, NY

Cross flow-control lock, a protective device for hydraulic flow-control valves, has been designed to prevent unauthorized personnel from tampering with hydraulic feed setting on production machine tools. Models are available for Vicker's ¼-in. flow-control valves and remote control panels.

The Cross Co, Dept 16P, Detroit 7, Mich

Dalmotor SR-43, for intermittent duty, has been designed for such applications as low- or high-speed, linear- or rotary-actuator mechanisms. Unit incorporates an automatic clutch brake which applies 2 in. oz of brake torque to the load, and disengages the armature automatically when power is removed.

Dalmotor Co, 1309 Clay St, Santa Clara, Calif

Type AS-4 Vinsynite, corrosion-resistant metal pretreatment, has been improved; new version reportedly gives excellent performance when either baked or air-dried. Designed for use on all types of metals, both ferrous and non-ferrous, thus permitting treating various types of metals in the same production line without switchovers. Combines in one step the application of a phosphate coating and a thin primer-like film, thus achieving both corrosion-resistance and maximum adhesion for top coats of paint.

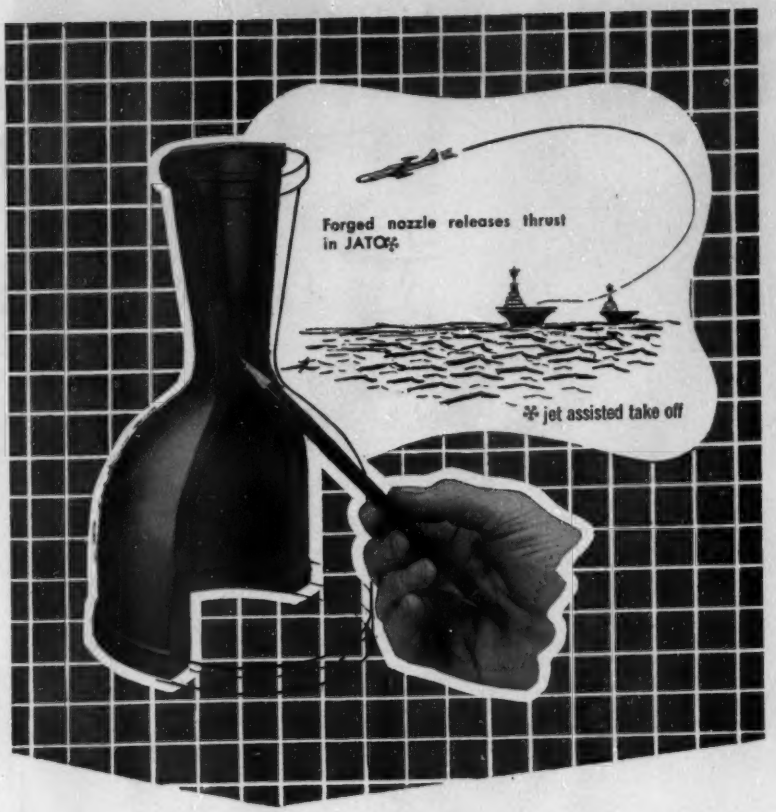
Specialty Coatings, Inc, Allegheny Ave, Oakmont, Pa

Rust Veto Spray is available in a 12-oz pressurized, push-button dispenser. Said to be particularly useful for protecting small items such as tools, dies, gages, precision parts, and items being stored. Sold in cases of twelve at $15.24.

E F Houghton & Co, 303 W Lehigh Ave, Philadelphia 33, Pa

Tempilsticks, temperature-indicating crayons, are now available for 413 and 438 F. These added items make it possible to determine temperature intervals intermediate to 400, 425, and 450 F, for which Tempilstiks have been previously manufactured.

Tempil Corp, 132 West 22nd St, New York 11, NY



Lets see if "Commercial" METAL QUALITY FORGINGS will reduce your cost...

Metal quality of the nozzles releasing the tremendous thrust which assists in the launching of carrier jet aircraft is of life or death importance. The slightest hidden metal defect in the "as-rolled" steel would become apparent during the external and internal upsetting used in producing this forged nozzle.

The savings in cost of this metal quality forging produced by "Commercial" was more than enough to absorb shipping costs for a distance of nearly 1000 miles.

Should you have problems involving the use of formed metal parts requiring durability, efficient positioning of metal for required strength and finishing—let's see if "Commercial" forgings will not give you a lower cost by saving metal and eliminating rejects before any machining is done. And don't fail to recognize that forgings combine strength with toughness for greater wear resistance and shock load. "Commercial" are forging specialists who produce a lot of unusual forgings. We will be glad to assist in your design.

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THE COMMERCIAL SHEARING AND STAMPING COMPANY
Youngstown, Ohio • Chicago, Illinois • Salt Lake City, Utah

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make your job EASIER... give you BIG SAVINGS too!

- Originators of Finished Machine Parts of Metal Powders
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- Large Parts, too—Over 20"
- ON-the-SPOT Service by Experienced Field Engineers

However you enjoy your leisure moments . . . fishing, gardening or just sittin' . . . it's more fun if your mind is free of "Shop" headaches. And that's why we're suggesting that you explore your designs for additional OILITE Finished Machine Parts applications.

Each OILITE Part is an ***Engineered*** Product—Precision Made by artisans with more than 20 years Know-How. Field Engineers, too, give you ***ON-the-SPOT*** Service.

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Detroit 31, Michigan

Field Engineers and Bearing Depots Throughout United States and Canada

OILITE Products include: Bearings, Finished Machine Parts, Cored and Solid Bars, Permanent Filters and Special Units of Non-Ferrous and Ferrous Metals and Alloys.

Wire rope pressing system enables worker to make as many as 20 or 30 splices in an hour as compared to 6 or 7 per hr using hand methods. It employs an aluminum alloy clamp or sleeve that is squeezed around the wire rope in a special 300-ton hydraulic press. Called JalKlamp, device is used as a mechanical method of splicing eyes, with or without thimbles, in the ends of wire rope. Splice gives 100% of breaking strength of the wire rope itself. Method can be used with a full range of wire rope diameters, up to and including 2 in.

Distributed by Jones & Laughlin Steel Corp, 3 Gateway Center, Pittsburgh 30, Pa

WL-F fork model Worklifter, designed to stack palletized loads, is battery-operated and has a hydraulic system of raising and lowering at 34 fpm. Rated at 750 lb, unit will take overloads up to 50%. Two models—WL-F58, with height of 6 ft 6 in., fork lift of 58 in.; WL-F78, with height of 8 ft 2 in., and fork lift of 78 in. Furnished in various widths to handle pallets up to 36 in. long and 42 in. wide.

Economy Engineering Co, 4511 W Lake St, Chicago 24, Ill

Mobile in-plant 3-wheel Fire Fighter is a one- or two-man truck with speed of 15 mph. Units can be equipped to carry complete high-pressure fog systems, 210 gal. of water, 100 ft of booster hose, rotary pump, foam concentrate, and any extinguishers, as well as axes, crow bars, first aid kits, and ladders.

Kalamazoo Manufacturing Co, Kalamazoo, Mich

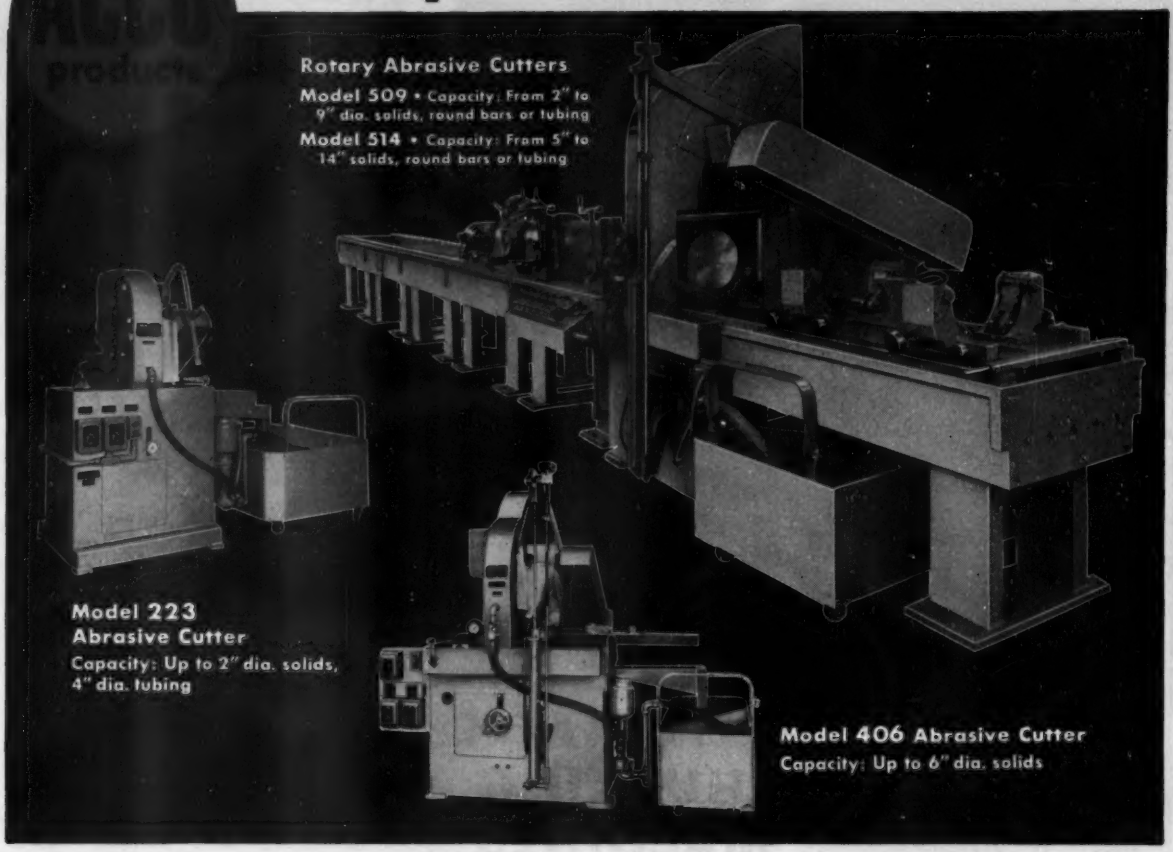
"K" Bond snagging wheel, a vitrified grinding wheel for use at speeds up to 6500 sfpm, is said to give up to 30% longer life with faster, freer cut. "K" bond was designed for Crystolon silicon carbide wheels in rough grinding cast iron. Less dressing is reportedly required to keep it sharp. The corners hold up longer without rounding, and wheels can be consistently duplicated from wheel to wheel and lot to lot.

Norton Co, Worcester 6, Mass

Lo-Hite jack, weighing 38 lb, can raise up to 30 tons in making repair jobs on overhead cranes. Hydraulically operated unit is portable; ram can be used as much as 8 ft away from pump. Jack, which can be operated from the ground, stands 6½ in. at highest, and is particularly adaptable for close-quarter lifting jobs.

Duff-Norton Mfg Co, Pittsburgh, Pa

Campbell Abrasive Cutters


Rotary Abrasive Cutters
Model 509 • Capacity: From 2" to 9" dia. solids, round bars or tubing
Model 514 • Capacity: From 5" to 14" solids, round bars or tubing
Model 223 Abrasive Cutter
Capacity: Up to 2" dia. solids, 4" dia. tubing
Model 406 Abrasive Cutter
Capacity: Up to 6" dia. solids

Quick cut-offs save you money—here's how . . .

By rapidly cutting stock that takes much longer by other cutting methods, CAMPBELL Abrasive Cutters reduce your labor costs and the number of machines required. They make quality cuts on alloy and high carbon steels. Close tolerances, smooth finish and straight cuts can be made, resulting in large savings of material. Cuts all types of stock without hardening and with minimum of burr.

It will pay you to remember these CAMPBELL features:

1. Superior Sales Engineering Service
CAMPBELL engineers, experienced in every type of cutting problem, are available for consultation on YOUR cutting problems.

2. Economy and Speed of Operation
CAMPBELL Abrasive Cutters are built to do every type of cutting job with the utmost accuracy, efficiency and economy. Cuts are smooth and practically burr free.

3. Complete Line of Standard Machines
CAMPBELL Abrasive Cutters are available in the widest variety of styles and models. They are fully automatic and semi-automatic. Have many exclusive features. . . .

Consultation with trained CAMPBELL engineers will cost you nothing. Let them show you how the addition, or substitution, of the right abrasive cutter can increase your output per man-hour. It could be the most profitable move you ever made.

Write today for Bulletin DH-301 on Campbell Abrasive Cutting Method

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AMERICAN CHAIN & CABLE

923 Connecticut Avenue, Bridgeport 2, Connecticut

Single set-up covering
ALL finishing operations...
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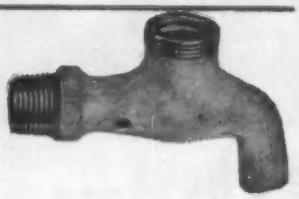
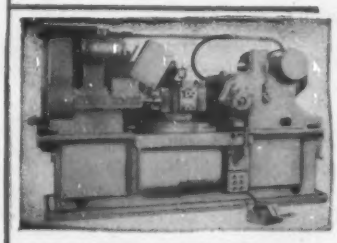
GREATER ACCURACY
with
GOSS DeLEEUW





AUTOMATIC CHUCKING MACHINES

One of the many important advantages being realized with this new chucker is the performing of ALL finishing operations on a single chucking of the work. In addition to the time saved, this feature, exclusive with Goss & DeLeeuw "1-2-3" machines, means only one handling of the work with an attendant greater accuracy. This machine is in a class by itself in precision finishing.

In Goss & DeLeeuw "1-2-3" Automatic Chucking Machines, one, two, or three ends of the work are machined simultaneously or in sequence. There is no need for resetting, retooling or secondary operations. More work from one machine and greater accuracy are matters of record.

Ask for illustrated literature describing the operation of this chucker in detail. Send samples of your work for time and cost estimates.

GOSS & DeLEEUW
QUALITY PRODUCT-QUANTITY

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

Tote Tubs, with capacities of 2, 4, 6 and 8 cu ft, are said to provide a 37% saving per cubic foot capacity as compared to cost of shop pans. Containers are designed for stacking, and can be handled when loaded with either lift fork truck or overhead hoist; empties can be easily handled by one man. Capacities range from 750 to 1500 lb.

Stephenson Industries, 548 E Fort St, Detroit 26, Mich

Heavy-duty tires made of tank-tread rubber are available for all Parker industrial floor sweepers. Tires are said to provide greater traction while sweeper is in use because of both material used and a wider tread. Said to be highly resistant to the chewing-away effect of metal chips and shavings, and deterioration by grease and oil.

Parker Sweeper Co, 100 Bechtle Ave, Springfield, Ohio

Series of soak tank cleaners, Vantrol 5617-A and Vantrol 5617-B, in addition to quickly removing heavy, oily soils, also remove marking inks that have penetrated into porous oxidized aluminum surfaces. Product, mixed at 8 oz per gallon and brought to a boil, will remove markings in from 10 to 20 minutes without injuring aluminum.

Van Straaten Chemical Co, 82 W Washington St, Chicago 2, Ill

Multi-purpose auxiliary bench, called Sturdi-Bilt Shop Tender, carries tools and parts to any job in the shop. Height adjustments can be made covering a range of more than 1 ft. Optional equipment includes a 24x24-in. bonded wood top with drop sides; 15x18x5-in. drawer; wheel set or casters. Basic model No. B-2020 is priced at $12.15; Model No. DW-2020-WT, which includes optional equipment, sells for $24.95.

Sturdi-Bilt Steel Products, 2501 W Peterson Ave, Chicago 45, Ill

MC-type storage battery has been developed for use in electric industrial trucks in which space available for battery is limited especially trucks of the driver-ride sit-down type. Said to afford a means of supplying most trucks of this design with as much as 25% more capacity than other types of Edison batteries can supply, without changing either steering-wheel or pedal heights, and without increasing either length or width of battery boxes. Standard assemblies range from 10-cell MC4, rated capacity 3.42 kwhr to 42-cell MC10, rated capacity 35.78 kwhr.

Thomas A Edison, Inc, Edison Storage Battery Div, West Orange, NJ

Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributors: Bethlehem Steel Export Corporation

Keen Edges Hold on Blades of Lehigh H and L

The shear blades shown here are representative of the blades used in pairs in power squaring shears manufactured by Wysong & Miles Company, Greensboro, N. C. The blades are hollow ground, and are made of either Bethlehem Lehigh H or Lehigh L tool steel. They perform economically at speeds up to 60 strokes per minute because they hold their cutting edges for long periods of time, in this way minimizing the need for frequent regrinding.

Lehigh H and Lehigh L are high-carbon, high-chromium tool steels. They form high-chromium carbide concentrations, meaning the ultimate in wear. With its lower carbon content and addition of 1.00 pct nickel, Lehigh L has unusual toughness. It is used for shearing thicker material where shock is involved.

TYPICAL ANALYSES

	C	Cr	Mo	V	Ni
Lehigh H	1.55	11.50	0.80	0.40	—
Lehigh L	0.85	11.50	0.45	0.30	1.00

You can count on good wear-resistance with Lehigh H or Lehigh L. If you would like to have more information about these steels and their use, we suggest that you contact your tool steel distributor, or write direct to us at Bethlehem, Pa.

BETHLEHEM TOOL STEEL ENGINEER SAYS:

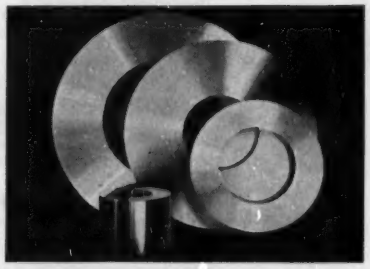
First Harden the Die, Then the Punch

In making up special punch-and-die sets, the fitting of the punch and die after hardening often involves hand grinding or stoning to remove the size changes produced during the hardening operation. The hole in the die will often close in, while the punch will usually expand in diameter. Thus the two parts will not fit, or will lose clearance.

In order to minimize such difficulties, and to reduce tool costs, the use of the following procedure is recommended:

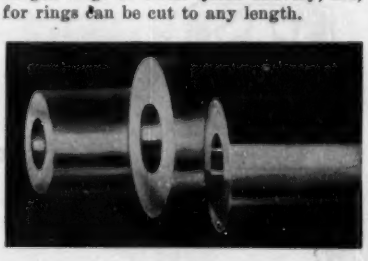
1. Make up the die, and harden it. 2. Make up the soft punch, and fit it to the die. 3. Harden punch. 4. If necessary, fit punch to die by grinding.

In this way, only one of the two parts is ground in the hardened condition, and the grinding is external and easier than internal grinding. To avoid excessive grinding, it may occasionally be advisable to allow for size-change in the die. But in the main this procedure can bring worthwhile economies.



HOLLOW-BAR TOOL STEEL IS IDEAL FOR RING-TYPE APPLICATIONS

BTR (Bethlehem Tool Room) Hollow-Bar is an excellent steel for hardened bushings, ring dies, draw rings and similar uses *(above)*. It is produced by high-speed trepanning, in which hammer-forged or hot-rolled round bars *(below)* are cored out, followed by rough turning on the outside. Hollow-Bar saves production time, for there's no need to wait for forged rings or discs. Quick delivery, too, for rings can be cut to any length.



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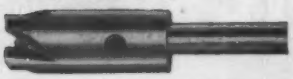


HOLLOW MILL

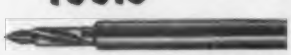
of these

STEP DRILL

multi-operation

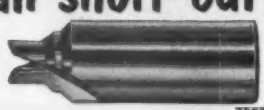
COUNTERSINK

tools



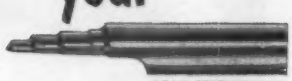
COUNTERBORE

can short-cut



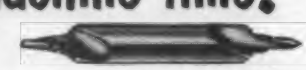
TREPAN

your



FOUR-STEP REAMER

machine time?



DOUBLE-ENDED STEP DRILL

Woodruff & Stokes design and produce small precision cutting tools to do, in a single operation, work often requiring as many as five separate machinings. Small, intricate holes of extremely close tolerances can be made quickly, easily, with W&S tools specially designed for each cutting problem. Let us tackle *your* problem—we may save you much valuable time.

WOODRUFF & STOKES CO., INC.
345 LINCOLN STREET
HINGHAM, MASSACHUSETTS

Metalset (A 101) is an aluminum compound for use in repairing castings, filling joints in sheet metal, and building up surfaces of patterns, molds, and dies. Adheres strongly to metal, particularly aluminum, and many other surfaces. Applied with a spatula or simple hand tool, cures in a few hours. Said to have excellent machinability and chemical resistance.

Smooth-On Mfg Co, 572 Communipaw Ave, Jersey City, NJ

Hatchet soldering iron, weighing but 3 oz, is recommended for fast soldering of instruments, small electronic equipment, and sub-assemblies. Because of design, iron is said to be more powerful than wattage rating indicates. Operates on ac or dc, any cycle; available in 110 and 220 v.

Hexacon Electric Co, 135 W Clay Ave, Roselle Park, NJ

Paint crayon is available for permanently marking cold surfaces wet, dry, rough or oily, and waxy or resinous coatings, on wood, metal, plastics, and rubber. The 4½-in. long marker is available in black, white, yellow, red, blue, and green.

Joseph Dixon Crucible Co, Jersey City, NJ

Prefabricated Weld-Bilt electric freight elevators, supported on welded steel columns independent of building structure, can be installed in any building, regardless of age. Motors lift or lower platforms or cage at rate of 39 fpm; capacities range up to 4000 lb. Units are practical for lifts up to four floors, and meet or exceed local safety codes.

West Bend Equipment Corp, 335 Water St, West Bend, Wis

APECO "Private Eye" Auto-Stat is a portable photocopy machine which is operated by plugging into any electrical outlet. In carrying case, unit measures 17 in. long by 11 in. wide by 12 in. high, and weighs only 24 lb. Machine handles letter and legal size copies as well as larger copies up to 11x17 in.

American Photocopy Equipment Co, 1920 W Peterson Ave, Chicago 26, Ill

Lubrite finishing process produces a permanently brilliant surface finish on metal parts made of Lurium (high purity aluminum). Finished metal can be made to simulate gold, silver, platinum, brass. Process is available under licensing arrangements.

Fromson Orban Co, 205 E 42nd St, New York 17, NY

engineers and PA's

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LITCHFIELD PRODUCTS COMPANY

NOW ROLL WASHING MACHINE WORM GEARS

This washing machine worm gear is rolled from STRESSPROOF by LITCHFIELD PRODUCTS CO., Litchfield, Mich.

STRESSPROOF®
SEVERELY COLD-WORKED, FURNACE-TREATED STEEL BARS

. . . CUT COSTS 40%

For years, STRESSPROOF has been recognized as an ideal worm gear steel. Several washing machine worm gears have been particularly successful. STRESSPROOF worms *outwear* the washing machine. STRESSPROOF's *ease of machinability* and *elimination of heat treating* keep costs down.

Now, the Litchfield Products Company, Litchfield, Michigan, roll the worm on this part for one of the largest washing machine manufacturers. The savings of 40% on the part cost is evident. Lead and pitch diameter requirements are maintained.

And there is no question as to gear life. STRESSPROOF's rugged wearability takes care of that whether the gear be cut or rolled.

STRESSPROOF makes a better part at lower cost. It's available in cold-drawn or ground and polished finish.

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Originators of Grinding Lubricants

Controlled forced air cooling is available for all Series No. 460 Lindeman brakes of either self-contained or built-in type. Where either heat-generated because of the load, or surrounding temperature requires it, high-velocity, low-pressure air lowers brake drum and lining temperature, counteracting expansion, extending service life and increasing operating accuracy and effectiveness.

Linderman Devices, Inc, Newburgh, NY

Vapor Wrapper, preservative pack aging paper for rustproofing metal, has been impregnated with a chemical which stimulates instantaneous production of protective vapor. "Instant Acting" VRI (volatile rust inhibitor) treated paper eliminates possible need for interim protection by preservative oils.

Nox-Rust Chemical Corp, 333 N Michigan Ave, Chicago 1, Ill

Four-way valve, hand-and foot-operated, has built-in, full-capacity, flow-control meters of the Venturi type. Air and low-pressure hydraulic unit is specifically designed for control of double acting air or hydraulic cylinders. Available in four standard pipe sizes: ¼, ⅜, ½, and ¾ in. for air, oil, or water, in pressure range 0-150 lb.

Airmatic Valve, Inc, 7317 Associate Ave, Cleveland 9, Ohio

Fleetwelder Special, a heavy-duty ac welder for production work, is available in 300, 400, and 500 amp, NEMA rated, sizes. It has a free circuit reactor control of welding current, separate from main transformer, which can be adjusted continuously through wide range of currents. Control is also sensitive to wide range of welding conditions, and highly responsive to changing arc conditions. Machines are equally adaptable to sheet steel or heavy plate.

The Lincoln Electric Co, Cleveland 17, Ohio

EutecRod 186, an improved, low-melting overlay for frictional wear resistance on ferrous and non-ferrous metals, is recommended whenever a copper base alloy is required. Can be used for building up or overlaying steel, cast iron, copper and alloys of copper and nickel, as well as for building up bearings, overlaying shafts, valve seats. Low heat of application, 1400-1600 F, minimizes danger of distortion and warpage.

Eutectic Welding Alloys Corp, 40-40 172nd St, Flushing, NY

...consult

Yes, we have the most modern machines and the know-how for making the "whole family" of Bevel Gears:

Coniflex or Straight Tooth Bevels; Miter Gears; Curved Tooth Spiral Bevels; Hypoids; Zerols . . . up to ninety-six inches diameter, of any material, in any quantity.

Each gear belonging to the *Spiral Bevel* "family" has certain definite characteristics which should be taken into consideration in relation to the particular power transmission job to be met . . . and this is just where *Phillie Gear's Engineering advice and recommendations* have proven invaluable to many firms over the years.

Regardless of the simplicity or complexity of your problems involving the use of gears, it will pay you to do as thousands of others have done . . . *Consult "Phillie Gear,"* and be assured of complete satisfaction.

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Worm	Sprockets
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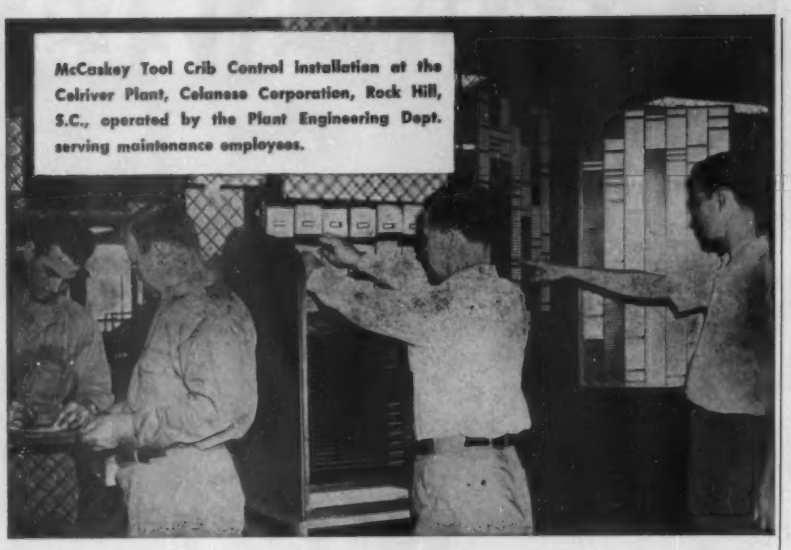
Industrial Gears & Speed Reducers

LimiTorque Valve Controls



McCaskey Tool Crib Control installation at the Celriver Plant, Celanese Corporation, Rock Hill, S.C., operated by the Plant Engineering Dept. serving maintenance employees.

Celanese Corporation of America employees and management approve

McCASKEY TOOL CONTROL

"Provides better labor relations . . . reduced tool purchases", to quote Mr. B. A. Morgan, Jr., Maintenance Engineer. Here's his complete report:

"We installed McCaskey Tool Crib Control at the beginning of plant operations and have found that our tool loss has shown a continued downward trend.

"The employee likes this system much more than older methods such as 'picking up brass', etc. It is a positive means of his protection against mistaken charges, as his signature and ticket number must match up with both his receipt and that of the Tool Crib Attendant's.

"The Company likes it because it speeds up operations; makes for better labor relations; and is practically fool-proof. We can locate a loaned tool almost instantly and thus save duplicate purchases of many expensive items."

Let us send proof of substantial savings thru both Maintenance and Tool Crib Control in Plants large and small.

MAIL COUPON FOR FURTHER DETAILS

McCASKEY REGISTER DIVISION
Victor Adding Machine Company
ALLIANCE, OHIO

Please send me all the facts concerning McCaskey Tool Control ☐; McCaskey Maintenance Control ☐.

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INDUSTRIAL CONTROLS
PRODUCTION - INVENTORY
TOOLS - MAINTENANCE - COSTS
THE McCASKEY REGISTER DIV.,
Victor Adding Machine Co.
ALLIANCE, OHIO
Galt, Canada Watford, England

Screw drivers for fine instrument work are available in nine blade sizes: 0.016, 0.020, 0.026, 0.030, 0.035, 0.041, 0.055, 0.070, 0.94 in. Blades are reversible, and replacements may be purchased separately. Furnished as a complete set of nine, or in sets of three.

Louis Levin & Son, Inc, 3610 S Broadway, Los Angeles 7, Calif

Magni-Focuser, a 3-D binocular magnifier, has been designed for reading fine calibrations. Magnified vision in third dimension said to insure greater accuracy and speed up precision work. Instrument allows free use of both hands and may be worn with or without eyeglasses.

Edroy Products Co, 480 Lexington Ave, New York 17, NY

Five protective coatings have been added to the Iridite line of corrosion-resistant finishes for non-ferrous metals. No. 4-73 and No. 4-75 (Cast-Zinc-Brite) are for zinc die castings. No. 18-P (Silver-Kote) is designed for industrial silver plate. No. 17-P (Cupreous-Kote) is for copper and copper alloy surfaces. No. 14-2 (Al-Coat) is a process for treatment of aluminum. Products are applied by chemical dip, without electrolysis, and without need for special equipment.

Allied Research Products, Inc, 4004-06 East Monument St, Baltimore 5, Md

High-temprature masking tape No. 113 has been designed specifically for masking pre-treated surfaces, such as anodized aluminum and magnesium. Is said to adhere at baking temperatures up to 350 F. The 60-yd-long tape is available in 15 standard widths ranging from ¼ to 3 in.; prices range from 80 cents to $4.80.

Behr-Manning Corp, Troy, NY

Alkaline cleaner for use in mechanical spray washers prior to phosphate coating has been developed, said to be entirely free of caustic soda. Elimination of this element reportedly makes crystalline structure of the phosphate coating much finer and more effective.

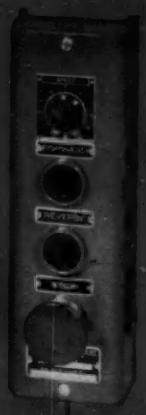
Detrex Corp, Detroit 32, Mich

Portable cabinet added to the "See-Thru" small parts drawer cabinet line, can carry a 100-lb load. Model JC-32-SD has 24 plastic drawers, each 1-7/16 in. high x 2¾ in. wide by 5⅞ in. deep, and one large steel drawer 3⅛ x 11½ x 5⅞. Dividers provide 72 adjustable compartments. Price, $15.95.

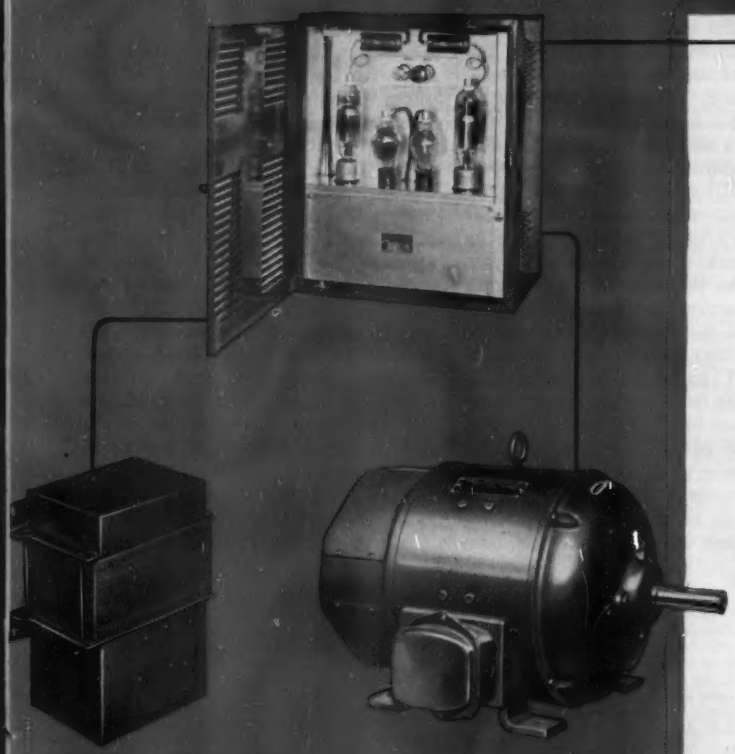
General Industrial Co, 5738 Elston Ave, Chicago Ill

Announcing

The NEW Louis Allis *Electronic* Select-A-Spede



- precision speed control
- wide speed range
- rugged, reliable construction



Connect this new Electronic Select-A-Spede to your A.C. power source and get infinitely adjustable speeds in ranges of 5:1, 20:1, or 50:1, with 100:1 also available for some applications. And that's not the only feature of this new variable speed drive. You get precise speed regulation — as close as ½% with tachometer feedback. You get rugged design for tough industrial service — simple, reliable, electronic circuits.

This new Electronic Select-A-Spede consists of an anode transformer, control panel, pushbutton station, and D.C. drive motor. Transformer and control can be located in almost any convenient place with motor and pushbutton station available in any enclosure you need. And you can get many electrical and mechanical modifications, as well as a variety of optional features — inching, reversing, threading, etc.

The Electronic Select-A-Spede is ideal for machine tools, test equipment, conveyors, printing presses, balancing machines — wherever high flexibility and precise speed control are needed. Get full information on this versatile new drive from Bulletin No. 1500. Ask your Louis Allis Sales Engineer for your copy or write to us.

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PCS... POWELL CUSTOM STAMPING... has been a leading supplier of stampings to the automotive, appliance and allied industries for more than 30 years. If you're looking for experience, facilities, high quality workmanship and down to earth prices let PCS give you an estimate on your next job.
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ROUND TABLE Discussion

SETUP STEW

Is there danger of friction between union and non-union men if the Master Mechanic's Office insists on doing special setup work in the shop? What's the best way to handle it?

THE foreman who permits a "setup stew" to simmer untended until it boils over into a grievance case has only himself to blame. Shop stews involving personnel, if left untended, are valid matters for the attention of the shop steward. In the case under discussion, you can't blame a union man for getting irritated at seeing a non-union man doing his work, and bringing grievance action through the shop steward. The foreman is unwise in minimizing the danger of union reaction to non-union work. He should attempt to resolve the setup problem before it becomes a case for the shop steward.

The trouble here seems to stem primarily from poor organization. The setup men from the master mechanic's office insisted on doing setup work in the foreman's shop despite the fact that he has perfectly capable setup men to do the work. To add to the confusion, the outside men, not being union, pose a delicate personnel problem in performing their work in a union shop. Union trouble has been engendered for less justifiable cause. But the basis for the foreman's action should be the short-circuiting of his authority in his shop by having outsiders come in and disturb setups, make his own setup men run errands for them, and, in general, cause the foreman and his men to lose prestige.

Weak administrative organization is characterized by friction between departments and supervisors. Friction arises most frequently where authority and responsibility are either indefinite or misplaced. When those at the top of an organization refuse to both delegate and define job categories carefully, friction and discontent cannot be avoided. The foreman cannot do his best work when he is by-passed and his duties and responsibilities are neither fixed nor followed in assigned work. When the foreman's authority is definite and understood, there is usually little cause to exercise it. Both subordinates and associates know where they stand and act accordingly. When a man has responsibilities without authority, those who work for him and with him usually attempt to see how much they can get away with.

The shop steward should not be regarded as a necessary evil. The steward is to the union what the foreman is to the company. He is the key man in the relationship of the union to management and the union to its members. It is his responsibility to protect the rights and interests of the union members just as it is the foreman's responsibility to protect management's interests. This relationship should not be permitted to result in personal rivalry, however, but should be the basis for a joint approach to problems with which foreman and shop steward are both concerned. The foreman should seek to establish a good working relationship with the steward. He shouldn't keep him at arm's length. In the light of today's management-labor relations, the foreman should be realistic in his relations with the shop steward. He should get acquainted and be prepared to enlist

"Completely automatic — even to notifying the operator of an improper adjustment."

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FYI—these initials symbolize information that's important. And there is much of importance in the literature listed here. To get the ones you need, all you do is fill out one coupon for each booklet you wish to order. Indicate in the circle on the coupon the number of one catalog wanted. When you have filled out a card, detach, stamp, and mail. We'll do the rest.

MACHINES AND ATTACHMENTS

1 JIG BORER—*Pratt & Whitney, Div, Niles-Bement-Pond Co, West Hartford 1, Conn.* 8-page folder describes Electrolimit unit 3E for precision and production work. Features of this smaller unit, with 12 spindle speeds of 30 to 1500 rpm, and 8 selective spindle feeds (0.0005 to 0.015 in. per rev of spindle) include new double-bit boring bar, and milling adapter.

2 THREADING HEADS—*Landis Machine Co, Waynesboro, Pa.* 11-page illustrated bulletin F-80-5 contains data on hardened and ground die heads, (which can also be used for hollow milling or high-speed turning operations) including Lanco, Landex, and Landmatic heads. Specifications tabulated.

3 JIG GRINDING MACHINE — *Fosdick Machine Tool Co, Cincinnati, Ohio.* 2-page bulletin describes the Moore-Fosdick jig grinder: combination of Moore jig grinding head with Fosdick automatic positioning table. Positions work ±0.0001 in. Unit grinds cylindrical and tapered as well as conical holes, with taper in either direction. Speeds range from 12,000 to 60,000 rpm. Additional features and specifications included.

4 MOLDING PRESSES — *Hydraulic Press Mfg Co, Mount Gilead, Ohio.* 7-page bulletin 5404 illustrates and describes hydraulic units for molding reinforced plastics. Specifications for 100-, 150-, and 200-ton models listed.

5 BORING MACHINE — *Ex-Cell-O Corp, Detroit 32, Mich.* "Tool Tips," Vol. 29, No. 7, 8, contain illustrated information on cam-operated Model 312, built for precision, finishing work such as contouring, boring, turning, facing, and grooving. Features outlined for accuracy, production, flexibility.

6 ENGINE LATHES—*Boye & Emmes Machine Tool Co, Cincinnati 16, Ohio.* 30-page catalog illustrates features of 14- and 16-in. heavy-duty series with 18 speeds; 20-in. medium duty; 20-in. heavy duty; 25-in. and 32-in. geared head models, all with 12 speeds. Accessories and attachments pictured and described.

7 ROTARY TABLE—*Vulcan Tool Co, Dayton 10, Ohio.* 6-page folder on motorized unit for lapping and grinding. Versatility illustrated, specifications given.

8 PRESSES—*Niagara Machine & Tool Works, Buffalo 11, NY.* 19-page bulletin 64-H gives detailed information on new line of straight-side double-crank units. Design features illustrated, specifications given for 50- through 200-ton machines.

9 LEADSCREW TAPPING ATTACHMENTS — *Automatic Methods, Inc, Elisabeth, NJ.* Bulletins 201 and 103 describe attachments for converting drillpress tapping setups to leadscrew tapping. Bulletin 601 illustrates features of heads for clamping to quill of any drillpress. Advantages of method, fixtures, applications, specifications given.

10 GRINDING WHEELS — *Norton Co., Worcester 6, Mass.* 28-page illustrated catalog 1052 covers abrasive types; bonding materials; wheel speeds, markings, and shapes; mounted points; polishing grain. Wheel specifications for hundreds of applications provided in tabular form.

11 ATTACHMENTS & ACCESSORIES —*South Bend Lathe Works, South Bend, Ind.* 40-page catalog 5418 illustrates and gives specifications on complete line for precision toolroom and engine lathes, turret lathes, drillpresses, bench shapers, and pedestal grinders. Features and construction data included.

TOOLS & ACCESSORIES

12 MULTIPLE CLAMPING DEVICE — *Design Aids Co, Newark 7, NJ.* Bulletin 1021 describes "Compensating Equalizers." Used in a vise or as a component part of a jig or fixture, unit clamps up to 10 parts simultaneously by automatically compensating for size differences in parts. Operational data, applications, types, and sizes included.

13 GRINDING WHEEL DRESSERS & CUTTERS — *Desmond-Stephan Mfg Co, Urbana, Ohio.* 28-page catalog 75 illustrates and describes extensive line. Application data given as well as detailed specifications.

14 SUBLAND DRILLS—*Mohawk Tools, Montpelier, Ohio.* 4-page circular 854 contains information on size-optional tools. In ordering, customer is limited only in relation to shank specifications, and partially on over-all length requirements; diameters and step lengths completely optional to fit particular application. Directions for ordering and specifications included.

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FYI
FOR YOUR INFORMATION

15 STATISTICAL QUALITY CONTROL — *Marchant Calculators, Oakland 8, Calif.* 51-page illustrated booklet presents illustrated data on history, definition, general phase, and specific functions, training program, control charts, sampling plans, and technical statistical techniques.

16 PROFILOMETER TRACER—*Micrometrical Mfg Co, Ann Arbor, Mich.* Bulletin LT94 describes Type GF tracer with dogleg beam for measuring surface roughness on internal tapers and hard-to-reach spots. Specifications provided.

17 MILLING CUTTERS & TOOLS — *Viking Tool Co, Shelton, Conn.* 44-page catalog contains illustrated design information and specifications on inserted blade HSS and carbide cutters, carbide single point tools, sharpening fixtures and methods, chip breakers, carbide grade chart.

18 PRECISIONAIRE INSTRUMENTS —*The Sheffield Corp, Dayton 1, Ohio.* 30-page catalog and price list on air gages, tooling, and accessories. Airflow column type Model 53 illustrated; contains amplifications and scales, and complete lists of standard sizes and types of air spindles, air snaps, other types of gaging units, and master setting disks and rings.

HEAT-TREATING AND WELDING

19 WELDING & CUTTING EQUIPMENT—*Air Reduction Sales Co, New York 17.* 52-page general products catalog ADC 662B describes and illustrates Airco gases, torches, tips, regulators, electrodes, etc. Includes data on Aircospot (inert-gas spotwelding) Easyarc 12 electrode, and new heavy-duty cutting attachments for torches.

20 THERMOCOUPLES—*Illinois Testing Laboratories, Chicago, Ill.* Bulletin 4181, "Alnor Pyrometer Accessories," gives specifications, applications, and performance data. Includes information on thermocouple alloys, temperature-millivolt relationship curves, temp conversion table.

21 BRAZING—*All-State Welding Alloys Co, White Plains, NY.* 24-page Brazing Manual contains illustrated data for processing shapes, sheet, castings, tubing, and assemblies of copper, brass, steel, aluminum, and cast iron.

22 ARC WELDING ELECTRODES — *Metal & Thermit Corp, New York 17, NY.* 30-page illustrated catalog on Murex mild steel and low alloy units. Contains selection data, formulas for estimating, heat-treating procedures, hardness tables.

PLANT SERVICE EQUIPMENT

23 TUMBLING EQUIPMENT — *BMT Mfg Corp, Elmira Heights, NY.* 8-page booklet "Modern Precision Tumbling," describes and illustrates Slide Honing process for finishing parts of all kinds. Unit, with a 48-in. revolving disk, can mount as many as 14 barrels of different shapes.

24 FORK LIFT TRUCK PERFORMANCE DATA—*Yale & Towne Mfg Co, Philadelphia 15, Pa.* Work kit contains material on method for predetermining times necessary for trucks to perform specific operations. Includes typical materials handling examples to demonstrate standard technique for application of data, as well as charts that provide times for basic truck motion elements.

25 MAGNETIC SWEEPER—*The Homer Mfg Co, Lima, Ohio.* 4-page bulletin MS-250 illustrates and describes line of hand sweepers for removing tramp iron and other ferrous metals from shop floors. Contains data on uses, advantages, operational information, and specifications.

26 FIRE HAZARDS & SAFEGUARDS —*National Board of Fire Underwriters.* 57-page illustrated Technical Survey No. 2 on fire prevention and protection of plant construction, process layout, and operations.

27 BLAST MACHINE—*Pangborn Corp, Hagerstown, Md.* 15-page bulletin 225 contains information on Blastmaster Rotoblast. Specifications and dimensions for all barrels from the 1½-cu-ft to the 27-cu-ft size; features illustrated; data on max weight per piece, max weight per load.

PARTS AND MATERIALS

28 DRIVES—*Link-Belt Co, Chicago 1.* 340-page standard products catalog 950 (thumb-indexed) covers chains and sprockets for conveying, elevating, and power transmission; line of enclosed gear drives, including parallel shaft helical drives, in addition to herringbone, worm, and Electrofluid; transmission products, including ball and roller bearings, babbitted bearings, pulleys, gears, clutches, and couplings; conveyor components. Capacity charts and dimension tables aid in selection.

29 WALL CHART—*Uddeholm Co of America, New York 17.* 18½ x 23-in. wall chart shows stock sizes of flat ground tool steels and drill rods. Sizes for both types included on same side.

30 IRON CASTINGS GLOSSARY — *International Nickel Co, New York 5.* 36-page booklet explains over 150 technical terms for users of ferrous and non-ferrous castings.

31 INDUSTRIAL PRODUCTS—*American Brake Shoe Co, New York 17.* 48-page illustrated booklet contains sections on ferrous and non-ferrous castings, bearing materials, sintered materials, steel forgings, welding products, air compressors, and industrial pumps. Details physical properties or characteristics where pertinent.

32 BEARING ALLOYS—*Mueller Brass Co, Port Huron, Mich.* 21-page illustrated handbook describes the 600 series, lightweight, high-strength, copper-zinc base products, available in six grades. Contains metallurgical data and chart showing nominal chemical composition, mechanical and physical properties of each; typical applications.

33 WROUGHT ALUMINUM WALL CHART—*Kaiser Aluminum & Chemical Sales, Oakland 12, Calif.* Shows new designation system for wrought aluminum and alloys. Conversion guide indicates old and new designations.

MISCELLANEOUS

34 GEARS, SPROCKETS, SHAFTS — *Penn Machine Co, Johnstown, Pa.* 24-page brochure describes company's facilities for producing these, as well as bronze castings and similar parts. Includes details on planning procedures, engineering, facilities, testing and inspection processes.

35 FROZEN MERCURY PROCESS — *Mercast Corp, New York 17.* 6-page booklet gives details of process for producing larger and more complex precision castings. Engineering drawings and charts.

36 FACILITIES — *Kell-Strom Tool Co, Wethersfield, Conn.* 6-page brochure describes company's engineering and research, electronic, and machining facilities. Specific production jobs illustrated.

37 TOOLS, DIES, JIGS—*Rockford Die & Tool Works, Rockford, Ill.* 4-page brochure illustrates variety of precision tools and production parts in which the company specializes. Production facilities described.

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From 50 minutes to 6. Burr removal and finishing of rack gears was formerly a 50-minute job by hand. Now, with the machine shown and Osborn Fascut® Brushes, the job takes only 6 minutes. Smoothness and uniformity are far superior.

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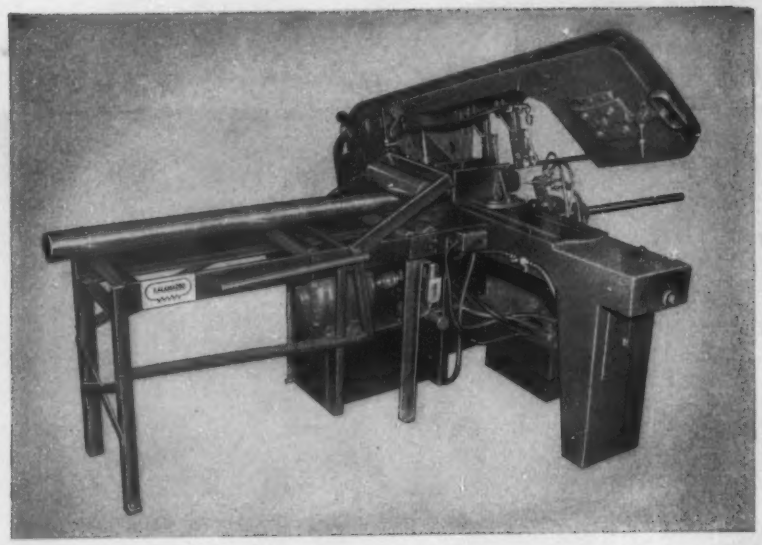
How he works. In making an **OBA**, your nearby Osborn Brushing Specialist studies your production with an eye to improving cleaning and finishing operations with power brushing. He gives you a written report with recommendations. His extensive experience is backed up by the facilities of the Osborn Technical Department.

Osborn Brushing Analysis

TO HELP YOU DISCOVER HIGHER QUALITY AND LOWER COSTS WITH POWER BRUSHING



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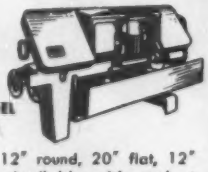
MODEL 1220



Cuts 12" round, 20" flat, 12" pipe. Available with coolant equipment and casters.

MODEL 610

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AUTOMATICALLY FEEDS HEX, ROUNDS, FLATS, PIPE, TUBING—ANY LENGTH FROM 3/16 INCH TO 12 INCHES*

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A completely hydraulic self-contained unit.

Easy to adjust . . . quickly installed . . . accurate repetitive cutting . . . no delicate electrical equipment.

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MACHINE TOOL DIV. *Kalamazoo* TANK and SILO CO.

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the cooperation of the shop steward in working out problems in his department.

Every steward has the responsibility, at times, of telling workers that their grievances do not represent valid claims. He is bound to lose some cases which the workers think he should have won. Sometimes the men may wonder if he tried as hard as he should have.

Alert management knows that an unsettled stew or problem, real or imaginary, expressed or unexpressed, is a source of potential trouble. The hidden grievance grows and rankles and soon arouses an emotional attitude that is completely out of proportion to the original complaint. When it reaches this stage the ground is laid for dissatisfaction which may lead to interruption of production. That is why it is important that the foreman resolve the underlying problem by having a firm understanding with his superior that setup work should be done by his own men who are well qualified to do the work. He can then talk the matter over with his shop steward and enlighten him on the action taken.

In my estimation, the setup problem merits the foreman's immediate attention before it becomes involved in the complications of union reaction to non-union work. If the front office has decided that setup work is to be done by the foreman's own shop, in his shop and by his own men, then it is management's responsibility to see that this procedure is carried through. It is particularly important that management define carefully the duties and responsibilities of the foreman and make certain that they are followed and not by-passed. Progressive management does not blame the foreman for stews and grievances in his department,

"These th' tools of a precision operator?"

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which shows and explains in detail the features of the Clark line of electric-powered lift trucks. The Electri-Facts Booklet disassembles the Clark electric truck to give you a mechanic's-eye view of all working parts—electrical control system, hydraulic system, power train, uprights, brakes, etc. Find out why Clark electrics give you better battery efficiency, why they operate a longer work-cycle than any other electric truck. Before you buy an electric truck, or any lift truck, you owe it to yourself to have the facts on Clark electrics. Use the coupon—send for your copy of ELECTRI-FACTS.

CLARK EQUIPMENT

Industrial Truck Division · CLARK EQUIPMENT COMPANY · Battle Creek 3, Michigan

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Developed especially for removal of large amounts of metal—with minimum feed .015 and maximum feed dependent only on available horsepower—ADAMAS PREMIUM GRADE 434 is outperforming all other carbide grades in hundreds of plants throughout the country.

Plant after plant reports large savings in carbide costs resulting from up to 50% increase in tool life. Next time specify ADAMAS PREMIUM GRADE 434 and watch your production go up and your costs go down.

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but rather judges him on how effectively he handles them and whether or not he is trying to eliminate their causes.

Example is better than precept. The foreman should solve the problem at its source by getting the setup question ironed out with his superior, thus eliminating the necessity for the shop steward to drag in the union angle. It's best not to postpone or procrastinate when a disagreeable problem demands solution. Learn right at the outset not to play with the spoon before you take the medicine. Putting off an easy thing makes it hard, and putting off a hard one makes it impossible.

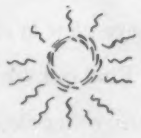
Ed's advice to Al to forget the whole thing on the grounds that he won't have trouble as long as he doesn't start it is no permanent solution to a recurring problem. Al should take the bull by the horns and demand a show-down on this delegation - of - authority question, even at the risk of getting into hot water with the master mechanic's office. I believe in getting into hot water; it keeps you clean.

Harry Kaufman
Philadelphia, Pa

SUGGESTIONS or EXTRACTIONS?

Should a toolmaker be eligible to participate in a Suggestion Plan, or is it part of his job to produce new ideas and better processes?

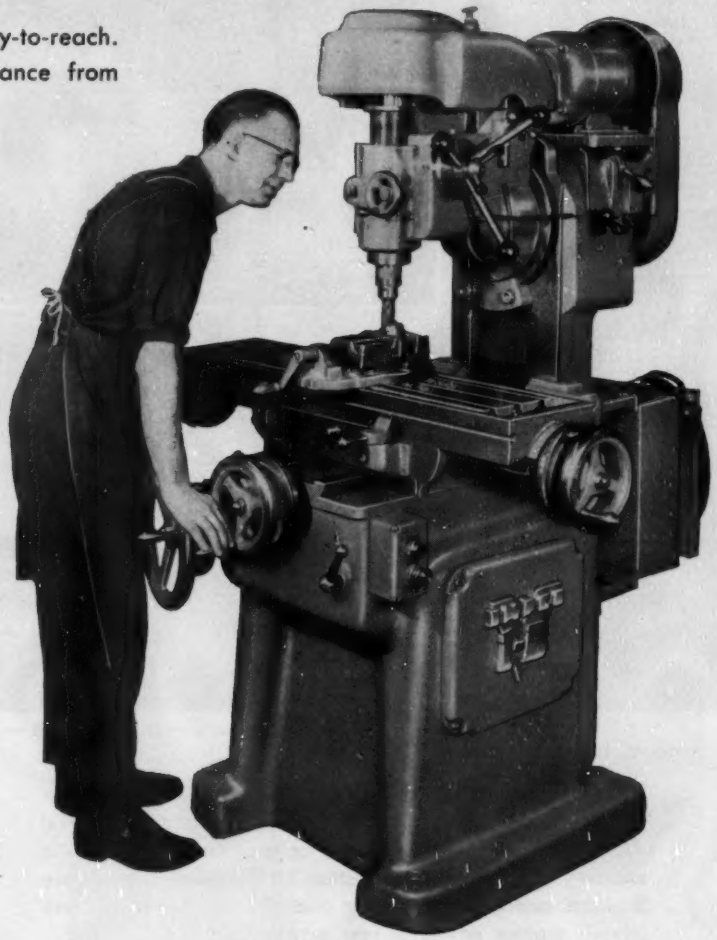
THE DEVELOPMENT of a suggestion system is something that should be given considerable thought before it is started. The planning of such an important program should not be left up to every Tom, Dick, and



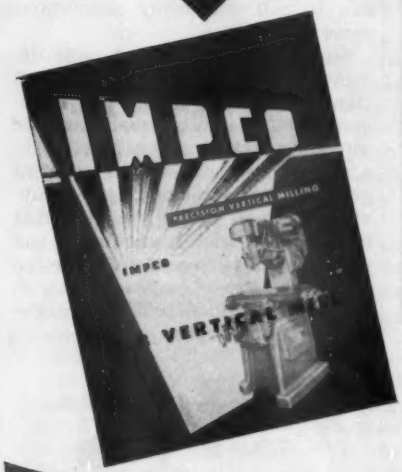
"I want to forget business but I keep thinking of my nice cool office."

Here's New Operating Ease in a Vertical Mill

- The head of the IMPCo Model 1-B Vertical Mill is *vertically* adjusted by a counter-balanced ram. The table does NOT move vertically.
- A Shot-Pin gives positive vertical spindle alignment after angular milling operations *without indicating the table.*
- Controls are centralized, easy-to-reach. They remain the same distance from the floor at all times.
- Dials are extra-large, easy-to-read for greater accuracy and operating ease.
- One shot lubrication system.



Get all the facts. Write for Bulletin AM-103.



IMPCO

INDUSTRIAL METAL PRODUCTS CORPORATION

Builders of IMPCo Straighteners, the American HEB Pilot Lathe, and Special Machinery

3400 W. ST. JOSEPH STREET LANSING, MICHIGAN

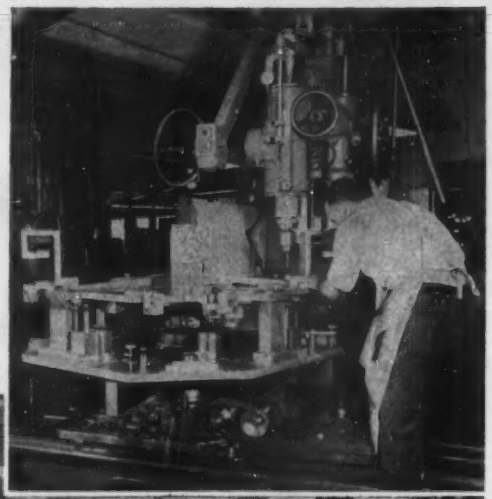
TOUGH PROJECTS OR PRECISION PRODUCTION CALLS FOR CONTRACT JIG BORING BY B. Jahn

BATTERIES OF THE LATEST JIG BORERS MANNED BY MASTER TOOLMAKERS MAINTAIN YOUR SPECIFICATIONS

. . . SCHEDULES

. . . SATISFACTION!

Jig boring a huge radar housing fixture. Over 200 individual holes were held to ten-thousandths tolerances.



In the large B. Jahn plant, 16 modern jig borers — in every size — are at the service of industry.

B. Jahn engineering superiority is continuously overcoming seemingly insurmountable jig boring obstacles. Whether it be a single fixture or a production run — a simple task or a real production headache — investigate B. Jahn contract jig boring and the dividends of time saved, money saved it can pay you.

DESIGN AND CONSTRUCTION OF DIES • TOOLS • JIGS • FIXTURES • GAGES • SPECIAL MACHINERY • JIG GRINDING • JIG BORING • KELLER DUPLICATING

FACILITY LIST AND LITERATURE SENT ON REQUEST. QUOTATIONS HANDLED PROMPTLY.

B. Jahn

B. JAHN MANUFACTURING COMPANY NEW BRITAIN, CONNECTICUT

Harry to work on. It is a specialized field and requires considerable thinking and planning. Each installation for each company must be tailor-made in order that complete efficiency is obtained from the system.

When the idea of suggestions was first developed it was installed as a more or less hit-or-miss arrangement. Some plans worked, and others didn't. Studies have been made to determine why some suggestion systems are successful and others are complete flops.

It has been determined that those companies who have successful suggestion systems are those who followed the idea that it was not just another whim or dream. They first really sold the idea to the president and all of the management staff. There was no question of doubt in anyone's mind about the idea, how it would work, or if it was to be successful. Everyone was behind the plan.

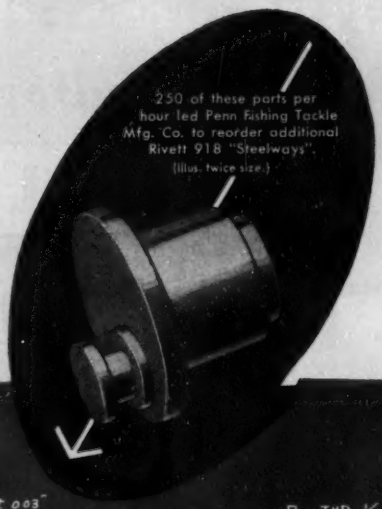
Next the program was sold to the foremen. Many sessions were held on this in order that each foreman—who must be the contact man with the plant—could become very familiar with the system.

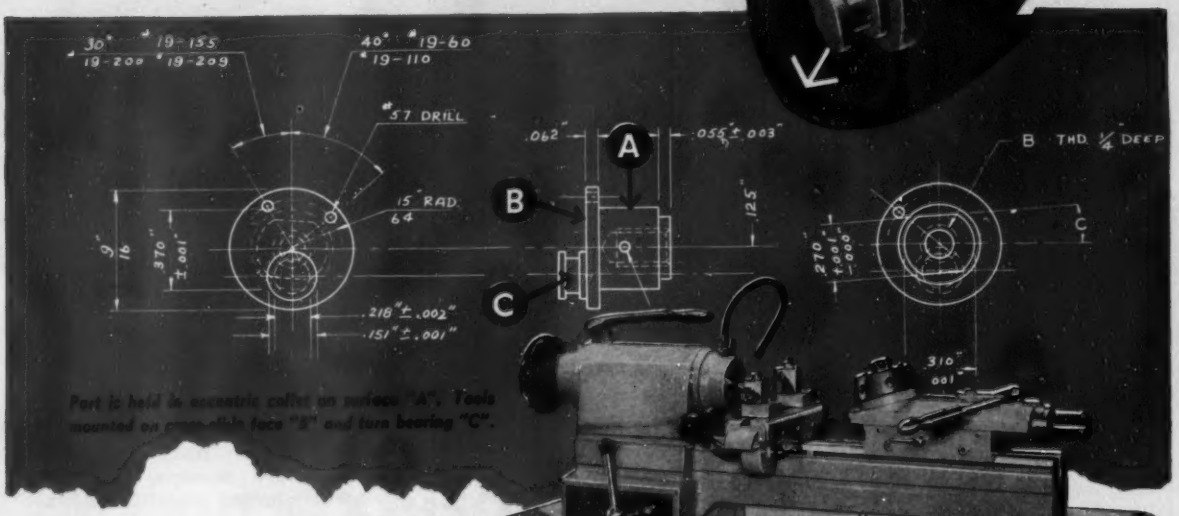
Then came the big problem of getting the plant and office to put in suggestions. At first the collections were few, but with a constant poster and publicity program, the ball began to roll and many suggestions came in.

Since the program was well designed to start with, the suggestion committee—made up of five members and a non-voting chairman who sometimes was the personnel manager, had no trouble with payment or eligibility of the suggestions submitted. Rules carefully stated that technical personnel, engineers, and management personnel are not eligible except for suggestions which do not pertain to their line of duty. For

"Having fun?"

INSTANT start-stop boosts Penn Fishing Tackle parts to 250 per hour!





Penn Fishing Tackle Mfg. Co. practices what it preaches. Its officials went fishing recently —to catch some ideas for stepping up production on several eccentric parts. Investigation of the Rivett 918 "Steelway" Cabinet Turret Lathe revealed that machine with its production drive was ideally suited to their requirements.

This production drive features "split-second" starting and stopping of the lathe spindle by movement of the lever chuck closer handle. With one forward pull, the operator closes the collet on the work, releases the brake and engages the spindle drive. When the lever is pushed back, the spindle drive is disengaged, the brake mechanism is applied and the work is released.

Installation of the 918 "Steelway" turret proved immediately successful. Production of troublesome parts was boosted two-fold. A 918 "Steelway" can boost your production, too! Why not go fishing and see what savings can be caught!

Model 918 "Steelway" Cabinet Turret Lathe.

← *Insert shows production drive.*
Motor runs continuously regardless of number of times spindle is started and stopped, thus eliminating overheating of motor.

RIVETT

RIVETT LATHE & GRINDER, INC., DEPT. AMR 9, BRIGHTON 35, BOSTON, MASS.

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TO MEET YOUR ASSEMBLING REQUIREMENTS!

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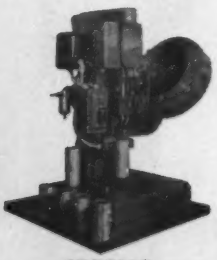
● *Action . . . More Action* . . . in your assembly department! *More Speed . . . Greater Accuracy . . . Lower Costs* . . . Vital factors in your production program. . . Advantages available to you through the DPS expanded line and increased manufacturing facilities. . . Tell us your story. . . *Let our trained engineers analyze your problem* . . . Whatever your feeding and assembling operations may be, they will come up with a practical solution.



SPECIAL ASSEMBLING MACHINE

GIVE US THE DETAILS . . . SEND SAMPLE ASSEMBLY.

DETROIT POWER SCREWDRIVER CO.

2821-A W. FORT ST. DETROIT 16, MICHIGAN

instance, an engineer on product design could be eligible for an award if he were to place a suggestion for the improvement of safety in plant operation, but not be eligible if it pertained to the company's product.

So we see that success with suggestion systems depends greatly upon good, sound rules, well-sold programs, and good worthy awards for the suggestions of merit.

Now in the case of a toolmaker, such as our friends are debating, the rule should read that if a suggestion made pertains to the actual work which he is performing, then he is not eligible. If his suggestion deals with something other than that which is outlined in his job description, he would be entitled to an award.

Certain abilities and know-how are required to hold jobs of skill. Toolmaking is a skilled trade. Therefore, he actually is a technical employee and the company expects him to work in its best interests and without extra compensation. However, if he should suddenly discover a new idea for a re-design of the product which could save money, then the company should pay for the suggestion.

No problem exists in a suggestion system if—when it is installed—all these points are made clear to the foremen and workers. It is only where improper installations have been made or where a company has just started the idea and has let it grow like Topsy that problems of this sort arise.

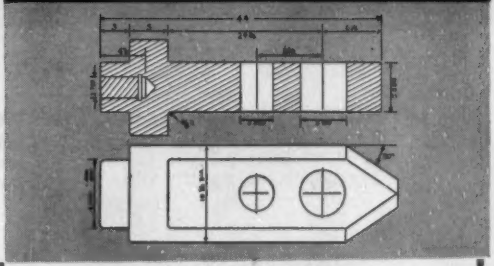
No one—except possibly the top key personnel—should be cut out of a suggestion system, but into the system must be written the proper operating instructions.

Charles D Townsend
West Hartford, Conn

"It can be stamped in one operation without further grinding, polishing, lapping or drilling. Got any idea what we could use it for?"

heavy jump cut job now turned 4 times faster

Courtesy Byron Jackson Co., Los Angeles, Calif.



on Axelson 25" Heavy Duty Lathe

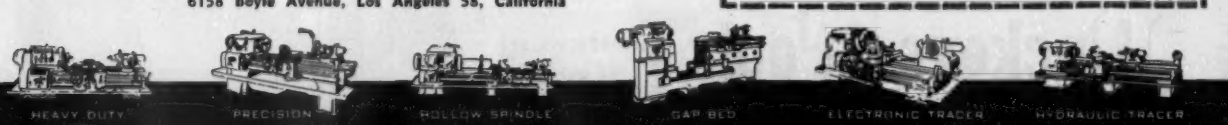
Four 4140 steel forgings for 300 ton oil drilling hooks having 3/8" to 7/8" stock and a severe interrupted cut are now turned FOUR TIMES FASTER on Axelson Heavy Duty Lathes, using Kennametal tools. These forgings brinell 311 and weigh 800 lbs. before machining and are only one of twelve different size drill hooks manufactured. More than eight hundred drill hooks have been turned on this Axelson 25" heavy duty lathe since 1945 and it is reported that "no excess machine wear has been experienced and the machine stands up very well." It is also interesting to note that the work is supported on the tail stock by a live center having a #6 morse taper shank.

Axelson lathes are built to stand up to this heavy type work and at the same time will produce to precision tolerances day in and day out. It will pay you to look to Axelson for recommendations on turning problems whether they are heavy duty, high production, or precision. Your welcome request for assistance is without obligation.

Write for literature describing Axelson Heavy Duty Lathes, models B-16", W-20", D-20", E-25", F-32", Precision Tool Room Lathes models 16, 20, or any of the models shown below.
6158 Boyle Avenue, Los Angeles 58, California

PERFORMANCE DATA

Part	300-Ton Drill Hook
Machine	Axelson 25" Heavy Duty Lathe
Number of Pieces	3 per lot (one of 12 sizes)
Material	S.A.E. 4140 Forging weighing 800 lbs.
Hardness	311 Brinell
Depth of cut	3/8" to 7/8"
Greatest Precision	+.000,—.006
Tool Material	Kennametal 17° lead angle. Tool is set on its side for a 17° negative back rake and 7° positive side rake. The tool post is turned for a 10° lead angle.
Feed	.033" per rev.
Speed	207 SFM
Floor to Floor Time	Approximately 3 hours.
Note	Formerly H.S.S. cutters were used.



AXELSON MANUFACTURING COMPANY DIVISION
PRESSED STEEL CAR COMPANY, INC.
LOS ANGELES 58, CALIFORNIA

PS&C

RAILROAD FREIGHT CARS • STANDARD PARTS • DAIRY & FARM EQUIPMENT • WASTE CONTAINERS • STAINLESS STEEL COOKWARE • CAR ACCESSORIES • TANKS • AGITATORS • SMOKE STACKS • DUST COLLECTORS • COAL & ASH HOPPERS • FITTINGS & ELECTRICAL ACCESSORIES • ORDNANCE MATERIEL • UNDISPUTED RELOCATABLE HOMES • EXPORT ONLY: LOCOMOTIVES & TRACKWORK • CARS (MINE, OIL, CANE, REFRIGERATOR) • UNDISPUTED METAL FRAMING • WEED BURNERS • BRICK & TILE MACHINERY • CANE LOADERS

in portable drills

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NOW! 5 IMPORTANT IMPROVEMENTS

360° EXHAUST DEFLECTOR
NOW—an exhaust deflector to satisfy every tool operator, can be positioned anywhere in full 360° circle.

PACKAGE VALVE
NOW—all valve parts can be removed in one unit for inspection, cuts maintenance time and costs.

QUIETER OPERATION
NOW—new design developments have improved the noise factor, make Buckeye air drills more quiet than ever.

MORE INTERCHANGEABLE PARTS. NOW—identical cylinders on all "A" Series drills, all handle types, permits smaller parts inventory.

PALM-FIT HANDLE
NOW—a tool completely free from annoying projections and angles, fits the hand in an easy, natural grip.

NOW—five important improvements have been added to Buckeye air drills, now more than ever your best buy! These are the drills tool room foremen prefer and tool operators ask to use!

No Buckeye tools in your plant? Then select your air tools by comparison, not habit. We'll be glad to put a Buckeye tool on trial in your plant . . . just tell us where and when, we'll do the rest and let you compare. Naturally, there's no obligation.

Buckeye Tools CORPORATION
DIVISION 15 • DAYTON 1, OHIO

producers of the world's first successful rotary air tools

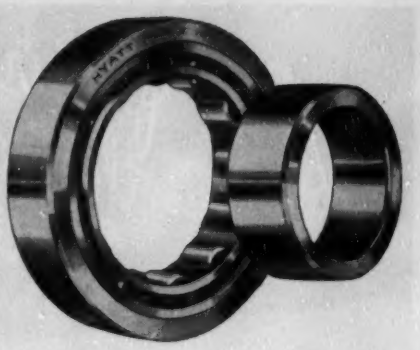
THERE CAN BE NO DOUBT that the making of suggestions to improve production is not one of the duties for which the average toolmaker is paid. It all depends on what is meant by the title "toolmaker." To most well organized firms he is an artisan, skilled in the art of toolmaking, and able to complete a projected tool design which is given to him in the form of a drawing, rough sketch, or verbal instruction. It is true that some plants use their toolmakers as tool designers and thereby find that their tooling costs are amazingly high and that the designs evolved on the shop floor are not shining examples of ingenuity and economy.

If we regard the toolmaker as a highly skilled machinist, working to instructions supplied by a designer working in a separate department, then he comes in the same category as a production machinist and is, therefore, entitled to any benefits obtainable from suggestion schemes and the like. One might say that setters on capstan and automatic sections are there to find out the quickest way of doing a job and are, therefore, not entitled to participate in the suggestion scheme and to earn its rewards. It is fairly safe to say that any employee who is directly connected with the physical transformation of materials into usable products should be allowed to earn a little extra by submitting suggestions for the improvement of various shop methods.

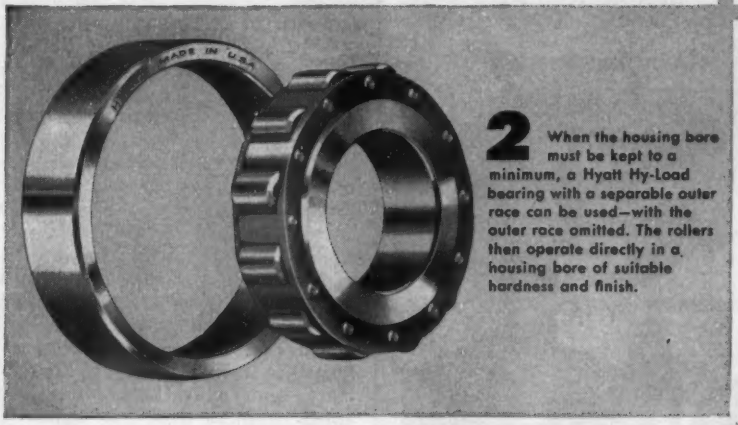
The bigger a manufacturing organization, the more persons should be eligible for admission to participation in the suggestion scheme. It is possible for a jig and tool designer to make a suggestion which will save money in the making of the company product, even though he is not directly employed on product design. It is a good policy to permit minor executives and designers to profit

"Don't you remember where the drawing was patched together with scotch tape?"

3 ways to handle your RADIAL LOAD PROBLEM

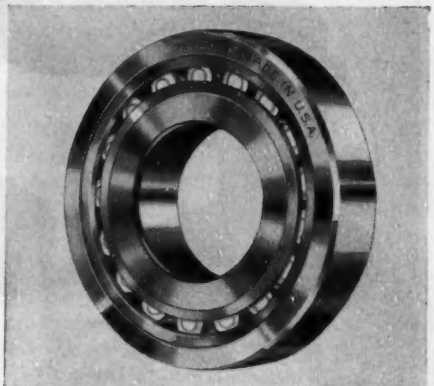


1 If your design requires a large shaft diameter to produce greater rigidity without disturbing boundary dimensions, a separable inner race type Hyatt Hy-Load bearing can be used with the inner race omitted. Rollers operate directly on a suitable hardened and ground shaft.



2 When the housing bore must be kept to a minimum, a Hyatt Hy-Load bearing with a separable outer race can be used—with the outer race omitted. The rollers then operate directly in a housing bore of suitable hardness and finish.

If your design applications involve radial loads, the best way to handle the job is with Hyatts—for Hyatt offers industry's most complete line of straight radial roller bearings! Hyatt Hy-Loads, for example, are made in three diameter series and two basic widths, to standard dimensions. There are ten major types—for the heaviest radial loads, and light or intermittent thrust loads. Four have separable inner races, two have separable outer races and four are non-separable, thus permitting wide flexibility in design and assembly procedures. Write for our general catalog No. 150—it will put the solution to any roller bearing problem at your fingertips. Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.



3 For designs requiring a bearing installed as a unit, there is the non-separable type of Hyatt Hy-Load. Whether you select a separable or non-separable type of Hyatt Hy-Load, they are available in a wide range of sizes.

HYATT

STRAIGHT BARREL TAPER

ROLLER BEARINGS

4 features that add up to 1 fact...

You can depend on JKS Diamond Tools

- Competent Selection of Diamonds
- Modern Plant with Modern Methods
- Qualified Field Representatives, Strategically Located
- Over 65 Years of Successful and Fair Dealing

Send for your copy of our Tool Catalog or perhaps you may wish to consult our engineering staff for assistance on *your* Diamond Tool problem.

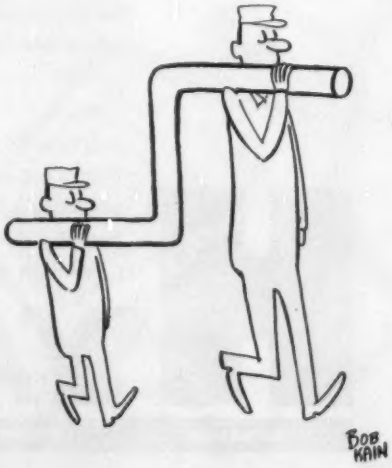
J. K. SMIT & SONS, INC.
Murray Hill, N. J.

from suggestions which they make for the improvement of efficiency in departments other than their own.

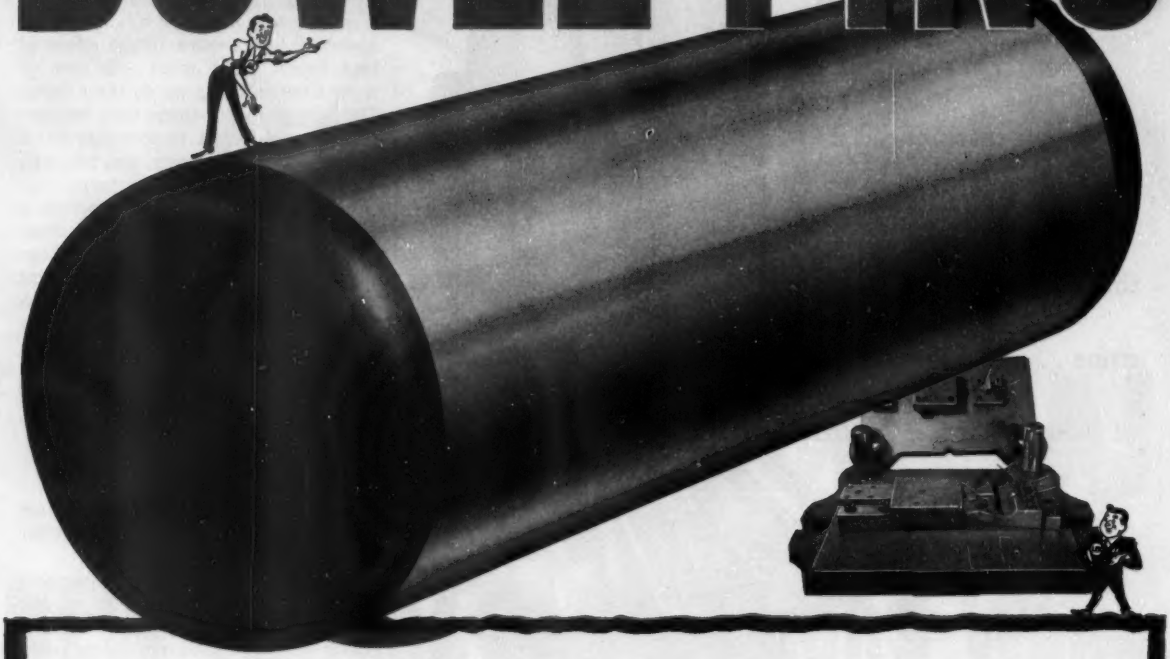
The employee-suggestion scheme is one of the most important innovations which can be introduced by the large manufacturing unit. Because of the organization setup, and particularly where you have operation planning concentrated in one central office, it is possible for the most wasteful machining practices to be put through as normal routine. The operation planner will play safe by specifying a machining method which is based on good standard practice; it is not his job to suggest something revolutionary which will involve him in a lot of extra work in the way of pursuing inquiries and thinking out a new method. He may have a flash of inspiration, but he will very likely suppress it if he can see nothing more substantial than a pat on the back as a reward.

I heard of an interesting little incident recently which illustrates the value of the employee-suggestion scheme to the big firm. In an aircraft factory, numerous small forgings in duralumin had deburring operation, and the process planner specified hand filing, with a suitable estimated time, and then forgot about it. A few weeks afterward he was shocked to find that the men performing the deburring operation were making double pay on the job which had an incentive bonus attached to it. He had faith in his estimated time which should have enabled no more than 25% bonus to be earned by the deburrers, so he decided to investigate the matter.

It was found that the deburring was done mainly by nightshift workers who were inadequately supervised, and two of the men had hit on a good idea. They cooperated by placing about 56 lb of the small



DOWEL PINS



HOW TO USE THEM

1. Precision Dowel Pins are principally used where parts must be accurately positioned and held in absolute relation to one another whether stationary or in motion. They facilitate quick disassembly and completely accurate re-assembly.

2. Allen Dowel Pins are also used as plug gauges.

3. As plugs for determining angular dimensions of dovetail slides.

4. As hinge and wrist pins in applications requiring initial and permanent accuracy.

5. As accurate, economical roller bearings and axles.

6. As guide pins, stops and position locators.

HOW TO JUDGE THEM

1. *On precision, for low tolerance applications.* (Allen Dowel Pins are ground to a maximum microinch finish of 6 RMS protected by a rust preventive.)

2. *On strength, for shear resistance.* (Allen Dowel Pins are made from special Allenoy Steel, heat treated. Single shear strength measures from 160,000 to 180,000 psi.)

3. *On hardness of surface and a core hard enough to prevent "mushrooming" when driven into a tight hole.* (Allen Dowel Pins have a surface hardness of 62-64 Rockwell C Scale and core hardness of 52-54. Average case depth .010 to .020 depending on size.)

The simple sure way to be sure of uniformly superior dowel pin quality is the same as in buying precision socket screws — *get genuine Allens from your Industrial Distributor.* Only he sells them but *we will welcome your direct request for literature or application engineering assistance.*

ALLEN HEAD

ALLEN

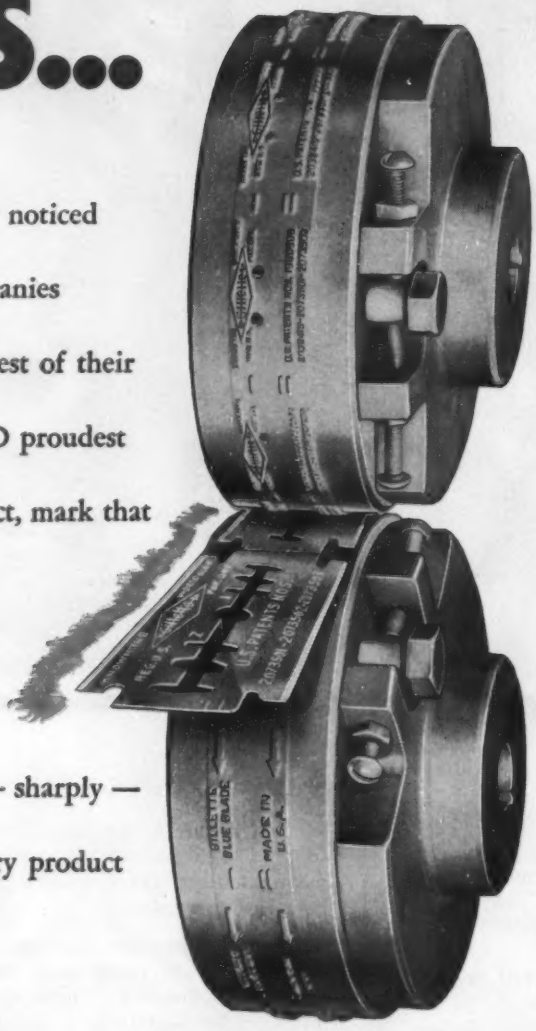
MANUFACTURING COMPANY

Hartford 2, Connecticut U.S.A.

Available in 108 Standard Sizes from ⅛" x ⅜" to 1" x 6". Standard tolerance .0002 oversize. Most sizes also standard in .001 oversize for repair work.

MARKING DIES...

Have you ever noticed that the companies that are proudest of their name . . . AND proudest of their product, mark that name clearly — sharply — legibly on every product they make.



. . . Chances are, if it's a name you remember the marking die is made by Parker!

SEND FOR THIS 36 Page CATALOG "MARKING TOOLS" NOW!

THE PARKER STAMP WORKS, INC.
MARKING DIE & MACHINERY DIV.
FRANKLIN AVENUE • HARTFORD, CONNECTICUT
by Parker

forgings in a large sack and each man grasping one end of the sack proceeded to shake up the contents vigorously. Shaking was carried on at 10-minute periods until the sack contents had been shaken for a total period of about an hour. When removed from the sack, the forgings were deburred beautifully and were passed by inspection without hesitation. As the men were able to do about 16 hours work in the space of two hours, they spent the rest of their time catching up on their sleep. Unfortunately for them, they became greedy and began to increase their output until their bonus was too high to pass notice without comment.

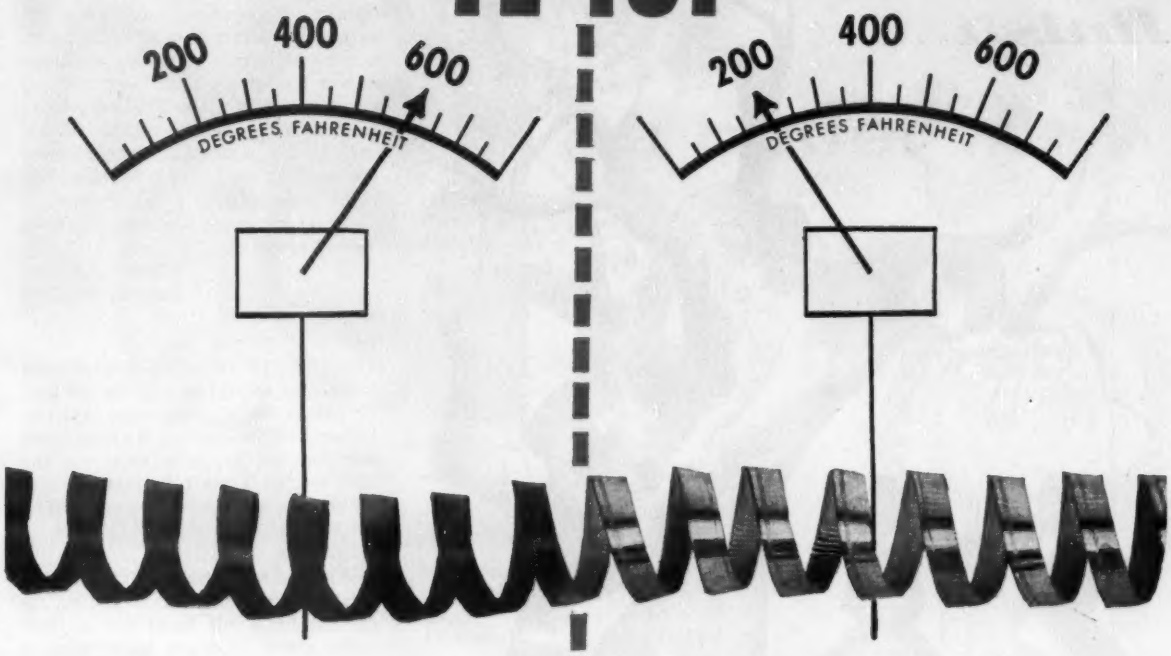
Now, this firm does not operate a suggestion scheme. Had they done so, several things might have happened; the process planner might have come up with the suggestion that tumbling was a much quicker method of deburring than hand filing and would have put the suggestion forward in the hope of reward. The two operators could have made a joint suggestion in the hope of reward; they could prove that their method worked. All three men refrained from taking the initiative because there was nothing in it for them.

Apart from the obvious blind spots in the methods department of the above firm, it does indicate that as many employees as possible should participate in the works suggestion scheme. The hope of reward is the spark required to set off a train of important events in the manufacturing chain; without the initial spark, nothing will happen.

It is highly probable that the methods department of the firm mentioned were so worried about big jobs like spar and skin milling that they did not give a thought to the

"Well naturally, if you're going to say 3 plus 7 equals 10, we're going to arrive at different figures!"

TL-131



NEW coolant by Johnson's Wax reduces chip temperature 400°

On a lathe, using a conventional coolant, the chip temperature was 600° F. producing a burned and blue chip. Without stopping the lathe, the coolant was changed to new Johnson's TL-131. Immediately, the chip temperature dropped to below 200° as proven by the bright, natural color of the chip and by touch.

In repeated tests, new TL-131 was compared to all major brands of conventional coolants. In every test the exceptional cooling properties of TL-131 caused costly blue chips to become bright. In every instance TL-131 outperformed other coolants.

Coolness means Johnson's TL-131 can reduce costs in your shop. TL-131's *special chemical ingredients* dissipate frictional and work heat to give you longer tool life, less down time, finer finishes, increased production and greater profits.

TL-131 Is Economical

This new water soluble coolant is used diluted 40 to 1 with water. And, TL-131 is especially recommended for cutting hardened steels at high speeds. It does not contain sulphur or chlorine.

Try Johnson's TL-131 in your shop

Try TL-131 on the toughest job in your own shop. You MUST be satisfied because TL-131's outstanding performance is guaranteed. A test is easily arranged. Simply contact your local Johnson Distributor or write to:

Industrial Products Division · Dept. AM-9
S. C. Johnson & Son, Inc., Racine, Wis.

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ABRASIVE BELTS

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ABRASIVE PRODUCTS, INC.
561 Pearl Street
South Braintree 85,
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relatively insignificant job of deburring small forgings. This is where the suggestion scheme really scores; it points up the small and unnoticed inefficiencies which are practiced as routine jobs. The man doing the job may see a better way of tackling it, but he will not voice his opinions unless he knows that they will be given a fair hearing. The suggestion scheme is the perfect method of assuring the most unimportant employee that his ideas will reach the right department; if the channel is there, then something valuable may flow through it.

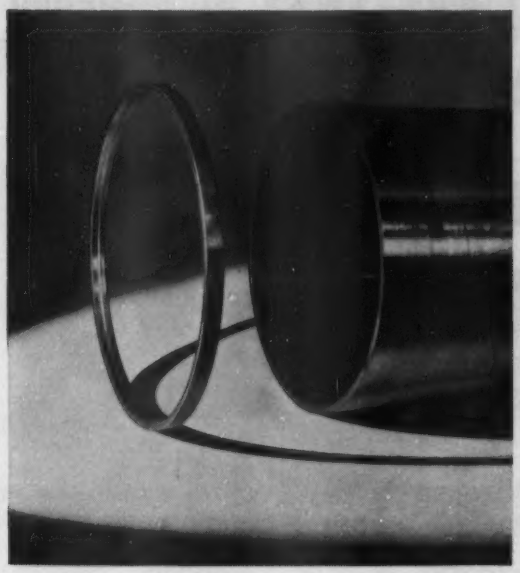
Clifford T Bower
London, England

THE QUESTION ARISES as to whether a toolmaker should be eligible for participation in a suggestion system. Before you decide that, Mr Employer, ask yourself if you want to get the best out of a man or just let him amble along as an employee drawing his so-much-per. Better give it some serious consideration.

Where does a good toolmaker's obligation end and where should he stretch forth his hand for a little more gravy from the boat? Now it so happens that some foreman, reflecting on the days when he drew top pay at thirty-two cents per hour and wasn't paid time and a half for all hours over forty, thrusts his thumbs in the arm holes of his vest and says to himself, "Now when I was on the bench I had to work for my thirty-two cents and look at what they are handing out now!" Could it be that Ed is growing a little ulcer as he thinks about paying anyone extra money for making a suggestion, or is he kicking himself because his old man was in such a hurry to bring

"Don't be so cheap! Buy a safety hat!"

RADIOGRAPHY reveals...



This stainless steel ring must be brazed to the cylinder. The bond between them must be sound—for the ring must hold the cylinder in place despite high stresses.

a better way to yield a better job!

THIS IS where radiography has done a double job. First, x-rays probed the structure of the bond, showed when it met requirements or when lack of fusion meant the part must be rejected.

Then, radiography went further. It helped reveal a new technic for brazing these two parts—a technic which yielded sound joints almost every time.

So, add another instance where radiography is more than paying its way. By doing such jobs as this, by testing pipeline joints, by proving soundness of the welds in pressure vessels, it is opening up new fields to welders.

Radiography can help you build business as well as earn a reputation for good work. Would you like to discuss how? Talk it over with your x-ray dealer.

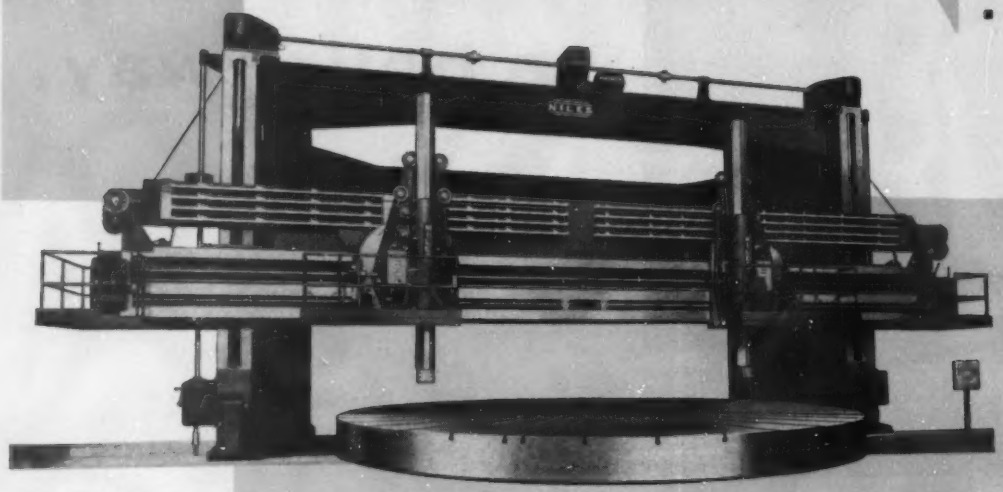
EASTMAN KODAK COMPANY
X-ray Division
Rochester 4, N.Y.

Radiography...

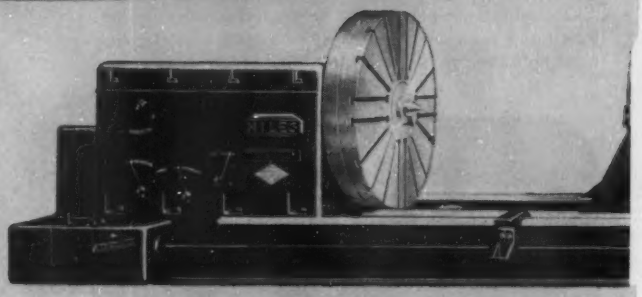
another important example of Photography at Work.

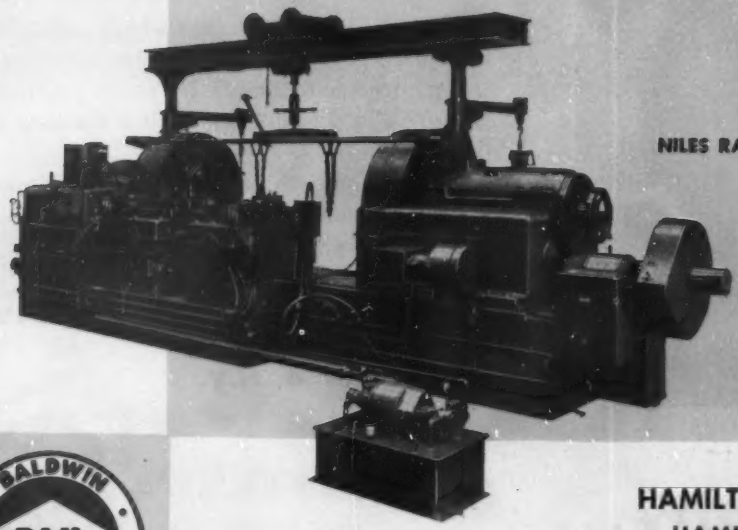
Kodak

B-L-H MACHINE TOOLS designed ... built



NILES VERTICAL BORING AND TURNING MILLS— 10' 12' 14' 16' 20' 30' and 43' *(shown above)*





NILES RAILROAD TOOLS— Hydraulic Car Wheel Lathe (at left); End Drive Axle Lathe; Hydraulic Centering Machine; Hydraulic Diesel and Car Wheel Borers; Hydraulic Axle Burnishing Lathe

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HAMILTON DIVISION
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for modern speeds and automation

ruggedly for lasting precision

NILES

BORING MILLS
ENGINE LATHES
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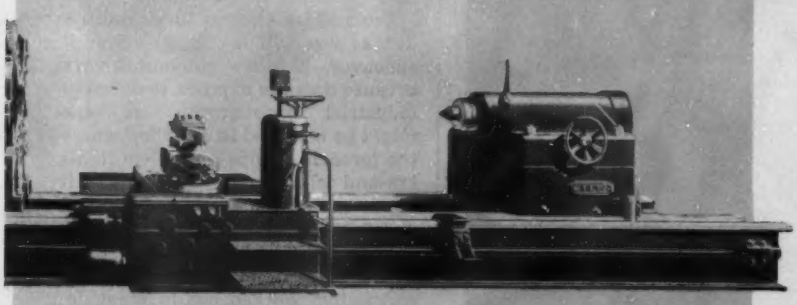
MECHANICAL PRESSES

NILES HEAVY ENGINE LATHES—
40", 50", 60", 72", 84", 96" and larger sizes



HAMILTON MECHANICAL PRESSES—
single, double and triple action presses for metal forming and stamping; also open back inclinable presses, rail presses, welding presses and die fitting machines.

For full information on these B-L-H Machine Tools see our 12-page catalog in Sweet's Machine Tool Catalogs . . . or

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Bay State Taps produce threads of the utmost precision with a maximum of productivity. This dual quality of Bay State Taps . . . precision performance . . . is readily available from nearby shelves of industrial supply distributors.

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him into the world thereby causing him to miss the gravy boat!

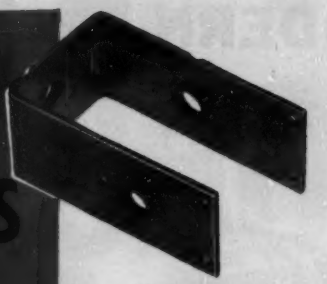
Just because a man is highly skilled, and possesses unusual resourcefulness because he built his potential through many years of varied experiences, can we with any degree of sound wisdom classify him as being incapable of giving out with some money-making ideas? He comes to us as an employee capable of high skill, possessing a calculating mind, and experienced in the class of work he is hired to do. I doubt very much if you can find many fellows whose minds are warped to such an extent that they are not aware of what skill, experience, and analytical reasoning implies on their part. Toolmakers know that they are hired to do a certain type of work, and we can take off our hats to the craft. They are a credit to our superior class of living, and then some lamebrain comes along with the idea that they are getting all they should and should not be humored with more extras through suggestion participation.

Toolmakers vary in their abilities just as you will find in any line of endeavor. Workers' obligations vary because they are exposed to different industrial environments. A man might be occupied in one shop where the foreman dumps a problem in his lap and tells him to figure it out; it might so happen that the boss will go into detail as to what he wants the man to do. The worker could be one of the many fellows who are given a drawing, worked out in great detail, and told to follow instructions absolutely, and that if any deviation occurred he could expect a gold star on his yellow slip.

It is easy to see that there can be no definite dividing line between the areas of where duties end and where

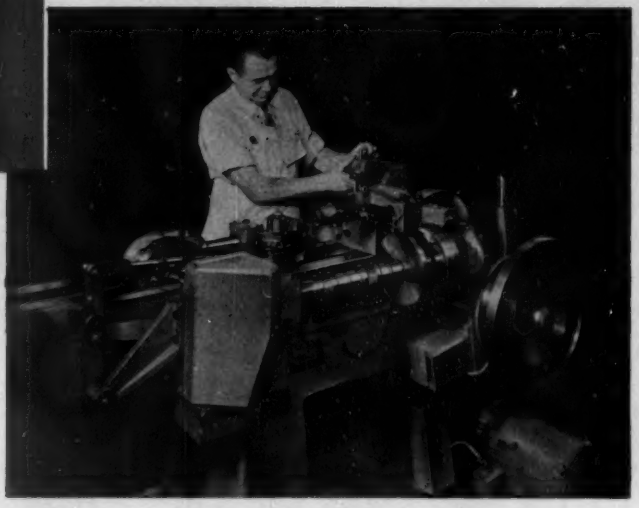
"Hey, Joe, we're converted!"

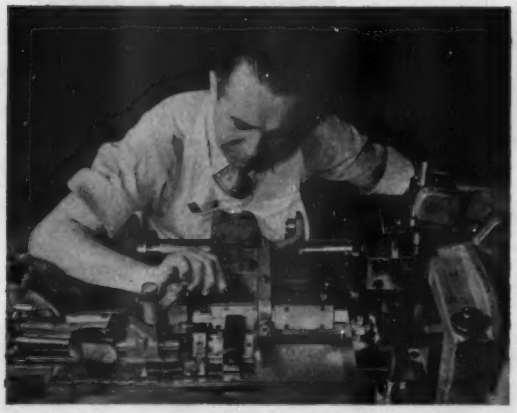
YOU CAN PRODUCE PARTS LIKE THESE ON THE U.S. MULTI-SLIDE®



U. S. Multi-Slide being tooled up at our plant prior to shipment. U. S. Multi-Slide Machines, when sold with tooling, are tested in actual production on your part and with your stock before being shipped.

Top of the bed of a No. 28 U. S. Multi-Slide Machine, with the operator making adjustments to the stock guides. Forming slides and vertical stripper movement, standard equipment on the machine, are shown at right in the photo.





All the parts shown here were tooled for production in U. S. Multi-Slide® Machines by the General Tool and Engineering Company, Dayton, Ohio. They illustrate just a few of the many different types of parts which can be produced complete in the U. S. Multi-Slide — without secondary handlings and at profitable high production rates.

The feed unit, ram, forming slides and vertical stripper (which are included as standard equipment) make it possible to produce complete parts of complicated nature to close tolerances at each stroke of the machine. The U. S. Multi-Slide may be tooled up to perform trimming, piercing, shearing, embossing, swaging and forming operations in a great variety of combinations.

You, too, can reduce labor costs, increase production and improve quality by using U. S. Multi-Slides for the production of your precision formed stampings.

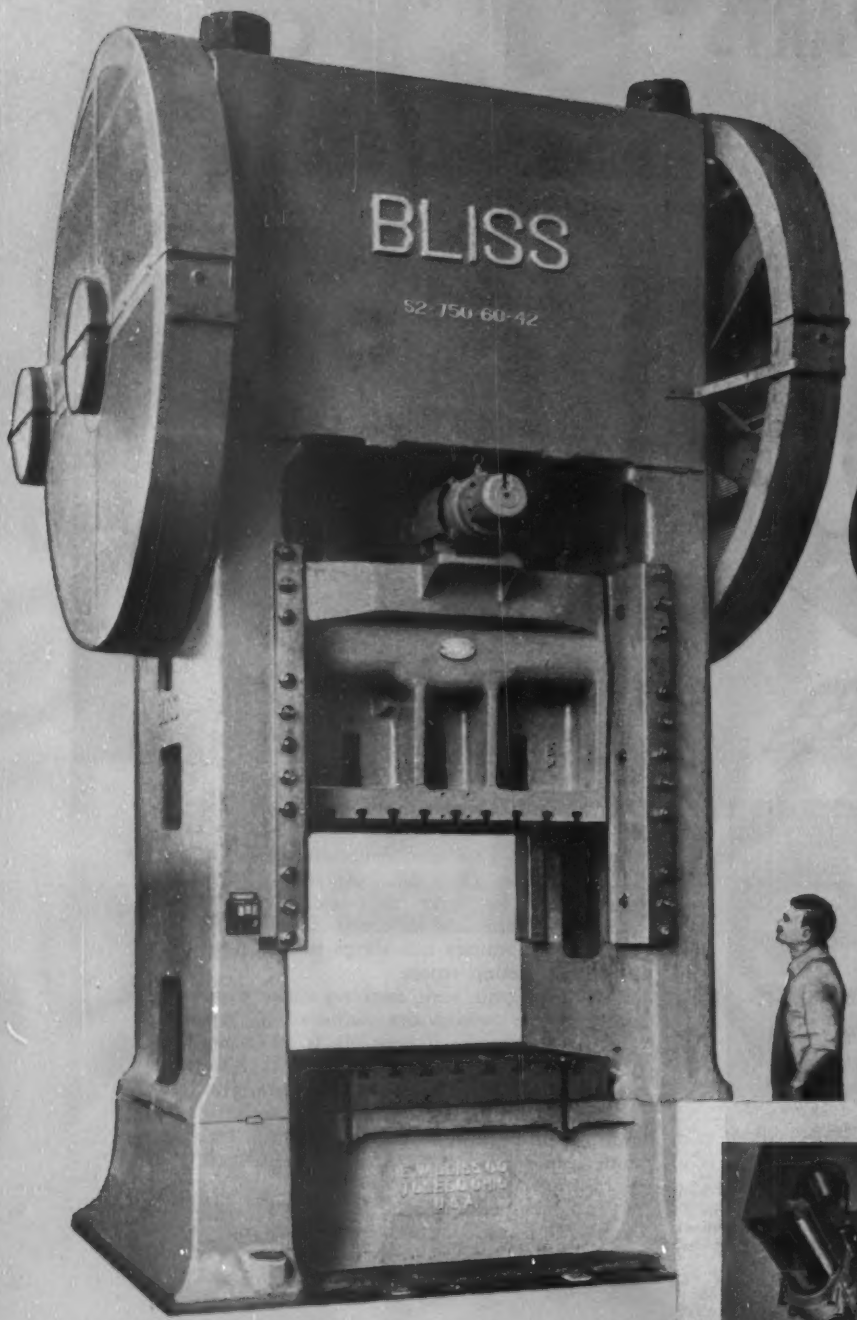
Bulletin 15-A contains complete specifications for all four sizes of U. S. Multi-Slide Machines. Ask for a copy.

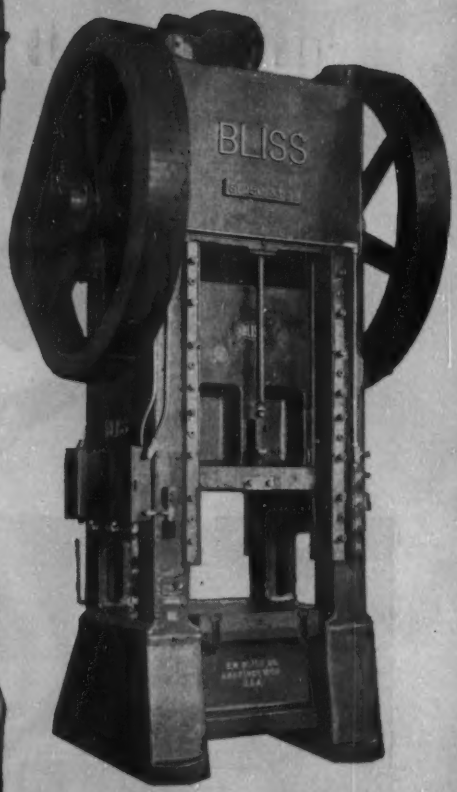
U.S. TOOL COMPANY, Inc.

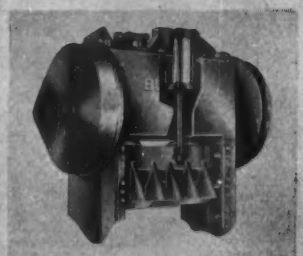
AMPERE (East Orange) NEW JERSEY

Builders of U. S. Multi-Slides — U. S. Multi-Millers
U. S. Automatic Press Room Equipment — U. S. Die Sets and Accessories

THESE MODERN BLISS STRAIGHT







Heavy box type crown, above, is reinforced with thick internal ribs front to back. Deep sections and large bearings provide rigid support for heavy SAE 1045 forged steel shaft, holds deflection to a minimum.

Air counterbalance, top right, maintains upward tension on main bearings —compensates for weight of dies, prevents backlash in gears, and eliminates takeup in main and connecting bearings when tension is reversed.

SIDE PRESSES ARE NOW

FIRST CHOICE

IN AMERICA'S METALWORKING PLANTS

About five years ago, we completely redesigned our single and double crank straight side press line—modernizing the line, complying with Joint Industry Conference standards, and adding many new features that resulted from careful study of user requirements.

While the presses were still in the blueprint stage, the news spread through industry. Relying only on the prints, enthusiastic customers volunteered enough orders to give one Bliss plant a four-month backlog before a single part was cast!

That enthusiastic acceptance is even greater today—with good reason. From the crown down these modern, rugged-duty presses offer as *standard* equipment unique design features like these—

- The new presses are heavier, with deeper, thicker box sections...larger bed and slide areas.
- They feature the long barrel-type connection, making possible a range of slide adjustments *100% greater than prior standards.*
- Gibbing is longer—slide is entirely within the gibs during working portion of stroke, *even when adjustment is down.*
- New cool-running air clutch with longer wearing linings is standard on most sizes.

Thanks to these and other new features, Bliss straight side presses have been proved—in plant after plant—to hold their accuracy longer. They've been proved to render far longer die life...to minimize maintenance.

And yet their cost is *less* than you might think. To get the complete story on industry's most modern straight side presses, write today for copies of Bliss catalogs 17-D and 9-D. They're yours for the asking.

Want more information? Only the highlights of the Bliss straight side presses have been revealed here. For *complete* description of the exclusive design features of industry's most wanted straight side presses, detailed specifications, and a full listing of the standard single and double crank presses available, write today for our catalogs 17-D and 9-D.

Remember: BLISS for Presses, Rolling Mills and Special Machinery

Motorized slide adjustment, above, with locking brake has fully-skirted sleeve and long bearing surface to insure support through full limit of adjustment ...eliminates need for ring risers and stools.

Friction plates, top right, on both clutch and brake are easily removed without disassembling clutch or removing it from press. This feature alone saves hours of maintenance time.

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on your press is more than a name... it's a guarantee

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Warco® PRESSES

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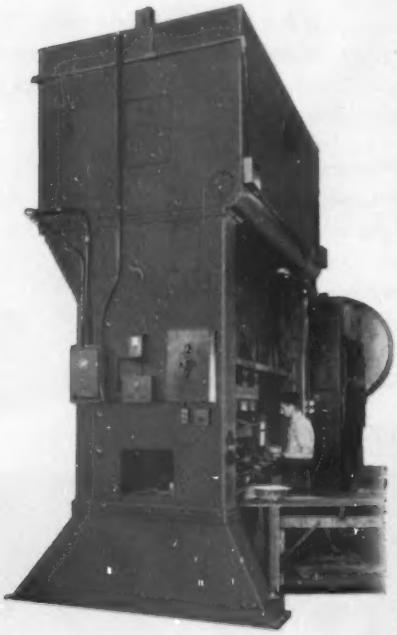

Ryerson-Haynes of Jackson, Michigan, a large automotive stamping concern, recently built a new addition and added a large group of WARCO Presses, because they knew from past experience they could depend on Warco to deliver highest production at low maintenance cost.

People who have WARCO Presses working in their plants find, upon checking maintenance records and press operators' opinions, that WARCO Presses are out in front when it comes to low cost production and operator preference. If you're not now using WARCOs, contact our local representative and he will refer you to a user in your area — for he knows that where users compare, where performance at low cost is a factor, WARCO is your best buy.

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THE FEDERAL MACHINE & WELDER COMPANY

WARREN, OHIO

Warco® PRESSES

extra mental effort begins. Let's establish a base of reasoning whereby we can determine whether a toolmaker should participate in a suggestion system. In the first place, a suggestion system is created not for the purpose of enabling a worker to earn more jack, but definitely for the purpose of creating greater production and better product. Any worker, be he works manager or janitor, should be eligible to send in a suggestion, whether it pertains to work that he is getting paid for, or not. Let the employees keep rolling in the suggestions with the understanding that payment would be paid according to the value of the idea and that a committee of reliable employees and members of the firm would decide as to whether the idea should be paid for according to the status of the worker to the idea given.

There is nothing that will throw a monkey wrench into the machinery of a suggestion system more than to resort to anything that will dampen the worker's enthusiasm — such as to inform the worker that no idea pertaining to the line of work for which he is hired can be considered as being a valid suggestion.

The chief idea behind the suggestion system is mental activity, perceptive shrewdness, and creation of a general idea of progress — all this leading up to increased production because of more efficiency throughout the plant. Many an idea improving production or quality of product has been conceived by a worker as he sat in his own kitchen reading the evening paper. (Thinking about some annoying situation on his own time — take note of this, Ed, old boy — on his own time!)

Bob Roundbottom
Laguna Beach, Calif

"Benny, this is a micrometer, and when I say eighth inch sheet . . . . ."

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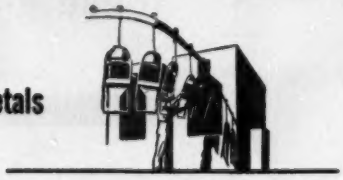
Long-lasting and safe
...good for steel, other metals



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Oakite Composition No. 161 is also highly recommended for cleaning steel and other metals in high pressure spray-washing machines.

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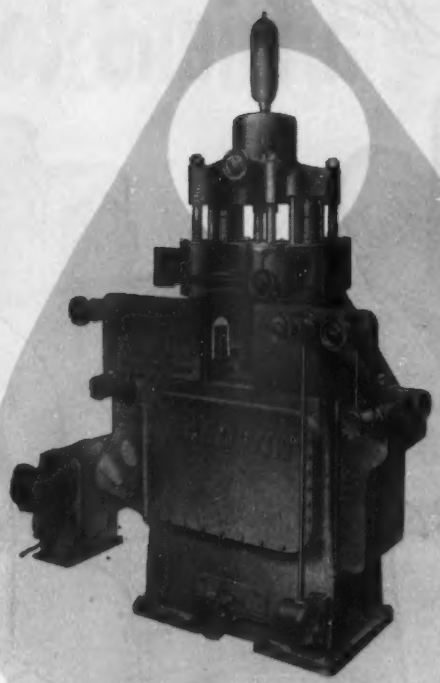
HYDRAULIC HEAD

avoids overloading, controls densities, in new Baldwin powdered metal presses . . .



See the Model "L" in action at Baldwin's Booth 1065, 36th National Metal Congress & Exposition, International Amphitheatre, Chicago, November 1-5.

YOU'LL GET a whale of a lot more by specifying a Baldwin Model "L" or Model "C" for your next powdered metal press. Why? Because these new Baldwin presses are the very first designed specifically for compacting powdered metals.

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For copies of new bulletins with full technical information on Models "L" and "C" please write to our Department 4502, Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pennsylvania.

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STANDARD MILLING CUTTERS

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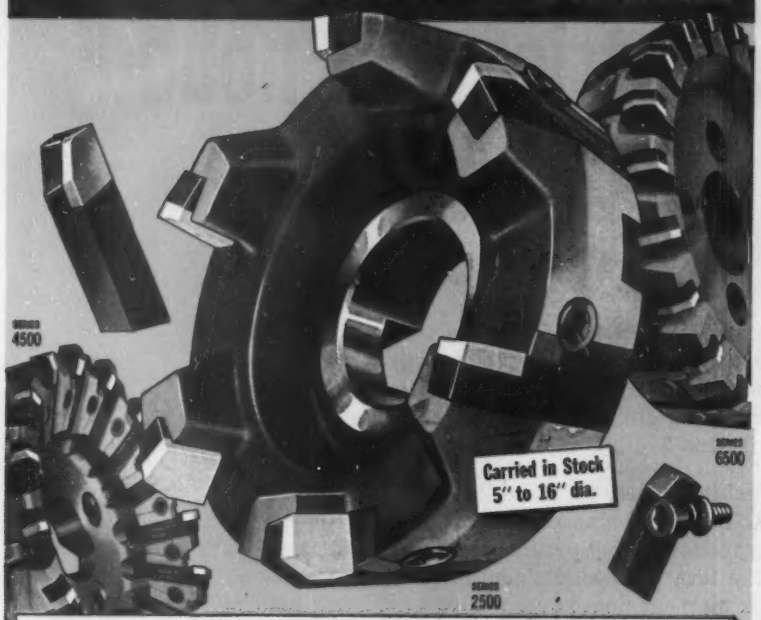

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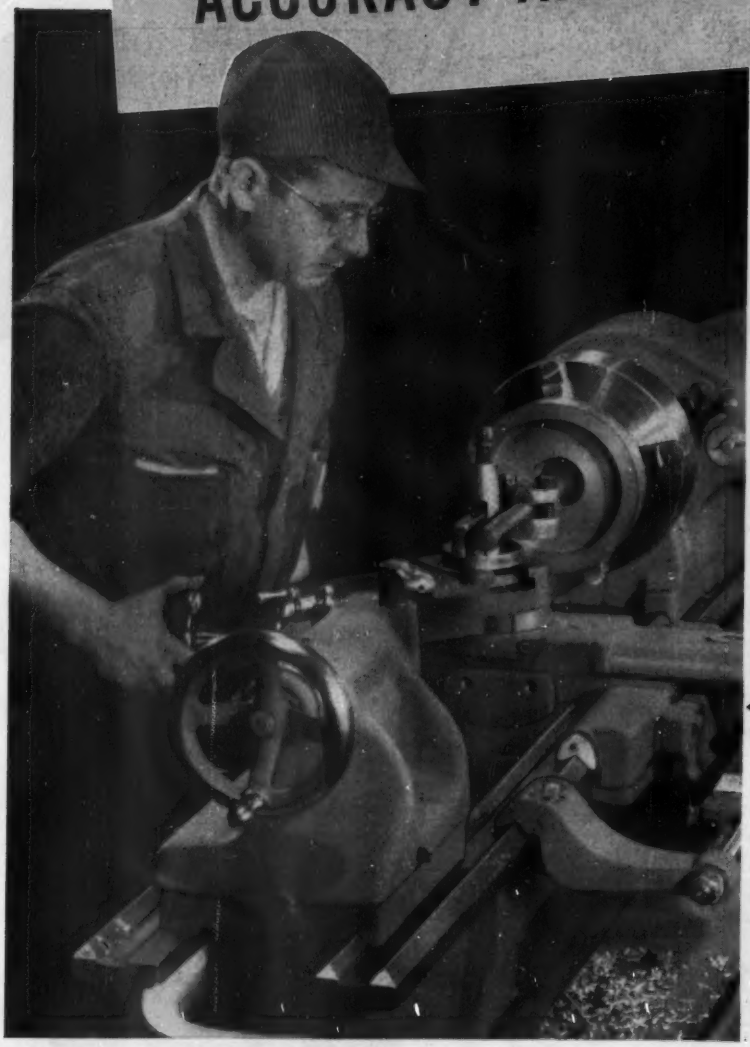

It's the value built into South Bend Lathes that adds the extra precision, adaptability and dependability that makes them so popular. This also brings to metal working operations an accuracy and productivity that means better products at lower costs.

South Bend Lathes have been doing this for years and years. They have been the choice of cost-conscious management for their efficiency and low up-keep. Machinists like them for their easy operation and ability to hold tolerances.

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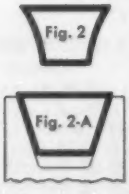
To prove how the CONCAVE SIDES of GATES VULCO ROPES *save money*, just make this simple test—

Bend *any* V-Belt that has *straight sides* (Fig. 1) and—as the belt bends—*feel* the sides *bulge out* (Fig. 1-A). This out-bulge concentrates the wear at the points shown by arrows—and this naturally shortens the life of a *straight-sided* belt!

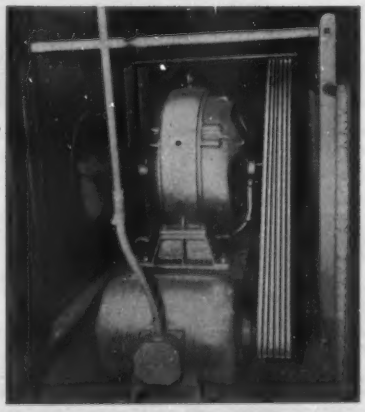
Now bend a Gates Vulco Rope with CONCAVE SIDES (Fig. 2)

(U. S. PAT. 1813698)



You find that the CONCAVE SIDES *fill out* and become perfectly straight. They thus press *evenly* against the V-pulley. All wear is distributed *uniformly* across the *full width* of the GATES VULCO ROPE—and this means *longer* belt *life* and *lower* belt *cost* for you!

When you buy V-Belts, be sure to get the V-Belt with the CONCAVE SIDES—the GATES VULCO ROPE!



Typical Gates Vulco Rope Drive—the Gates V-Belts are built with Concave Sides to insure longer belt wear

Gates

VULCO ROPE DRIVES

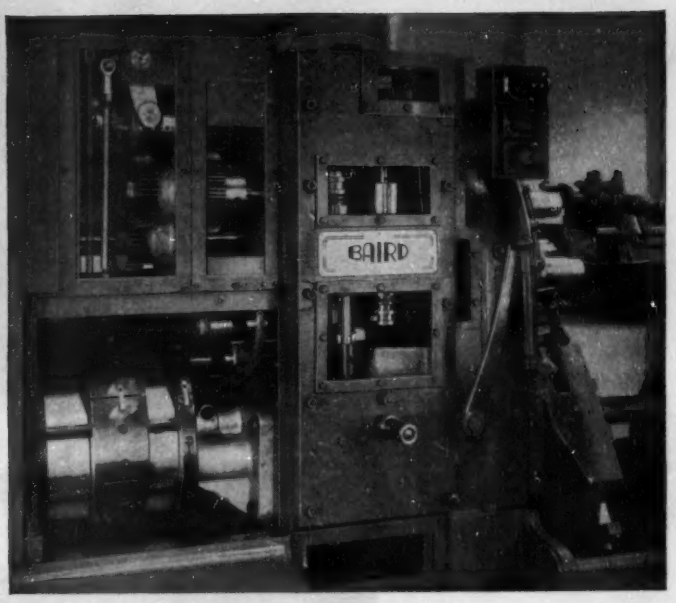
THE GATES RUBBER COMPANY
DENVER, U.S.A.

Gates Engineering Offices and Jobber Stocks are located in all industrial centers of the United States and Canada, and in 70 other countries throughout the world.

CS-549

. . . IF IT'S A HIGH PRODUCTION PROBLEM . . .

ASK BAIRD ABOUT IT



HERE'S BAIRD'S *Guinea Pig*

WHERE WE WATCH OUR OPERATIONS... *FOR YOUR BENEFIT*

One of the features of Baird machines that customers like best is that when they are tooled and put on production . . . they produce. In many cases, however, arrival at that happy result in our customer's plant is by no means as simple as it sounds. Hence our "Guinea Pig" and other special Baird engineering procedures. The "Guinea Pig," as you can see from this photograph, is just that . . . a regular Baird Multiple Spindle Automatic, with plastic windows let into its "hide" at many vital points. By this means we can check details of operation under controlled conditions. Cams, gearing, controls, interlocks, tool slide action, temperatures, lubrication, wear . . . just about every factor in performance . . . is seen, gaged and compared.

And that, we believe, is typical of Baird's whole approach to high production machinery and tooling. For years, people have said "ASK BAIRD ABOUT IT" only because they know we will give them the right answer. Send in your inquiries, gentlemen — we're never too busy to help.

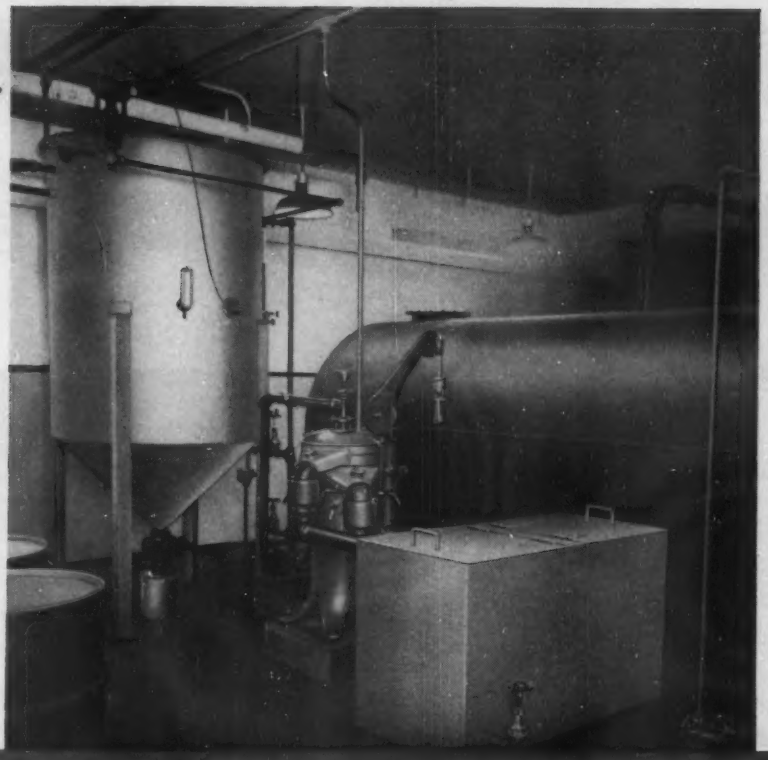
THE BAIRD MACHINE COMPANY
STRATFORD CONNECTICUT

WHERE YOU WILL GET THE HELP OF SPECIALISTS ON THESE ESSENTIAL PRODUCTION PROBLEMS:

[redacted]

1BA54

Cutting oil purification, storage, and distribution center in a large aircraft parts plant.



In the Machine Shop...

DE LAVAL CENTRIFUGALS PAY FOR THEMSELVES!

De Laval Centrifugals provide the quickest low-cost method of keeping factory oils clean and dry and of preparing coolants for re-use.

They bring about substantial production economies not only by the oil or coolant they save, but also in many other ways.

For example, here are some of the gains made when a De Laval Purifier keeps *cutting oils* free of abrasive particles: higher cutting speeds are permissible; tool life is often *doubled;* more accurate work is consistently performed; there is less wear on machine bearings lubricated largely by the cutting oil.

Regardless of what you manufacture, if you use machine tools to make it, it will pay you to investigate the *money-saving* possibilities of De Laval Centrifugals.

THE DE LAVAL SEPARATOR COMPANY
Poughkeepsie, New York ● 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5

DE LAVAL PURIFIERS & CLARIFIERS FOR FACTORY OILS

Choose your SURFACE GRINDERS from these 7 NEW DoALL MODELS

MODEL	D6-1	D6-3	D8-0	D8-1	D8-3	D10-1	D10-3
Chuck Size	6"x18"	6"x24"	8"x24"	8"x24"	8"x24"	10"x30"	10"x30"
Wheel Size	7"x½"x1¼"	8"x¾"x1¼"	8"x¾"x1¼"	10"x¾"x3"	12"x1"x3"	12"x1"x3"	14"x1"x3"
Work Height Capacity	12½"	12½"	12½"	12½"	12½"	12½"	12½"
Table Traverse	7½"x20"	7½"x26"	10"x26"	10"x26"	10"x26"	12"x32"	12"x32"
Spindle Motor	Direct 1 HP	Direct 1½ HP	Direct 1½ HP	Belt 3 HP	Belt 5 HP	Belt 5 HP	Belt 5 HP
Motorized Spindle Raiser	Opt.	Opt.	Opt.	Std.	Std.	Std.	Std.

New Sizes! New Accessories! New Versatility!

★ 7 Models—5 wheel sizes—4 chuck sizes.

★ Combination hydraulic and manual table and crossfeed traverse standard on all models.

★ Optional, all models:

- Fully automatic operation
- Flood coolant system
- Combination flood cooling and "Cool-Grinding" (coolant flows *through* wheel).
- Variable speed spindle drive
- Universal high speed spindle
- Cylindrical grinding attachment
- Crush form grinding equipment

. . . plus many others.

NEW DoALL Precision Surface Grinders are designed to reduce production line and toolroom costs through new performance standards:

1. *Precision* that permits complete reliance upon hand-wheel settings which eliminates frequent checking and therefore increases output and reduces errors.
2. *Versatility* that provides straight surface grinding, grooving, slotting, notching, internal grinding, crush form grinding, cylindrical grinding and other operations with the same machine.
3. *Power and rigidity* plus "Cool-Grinding" to produce heavier cuts and faster operation without sacrificing accuracy or finish.
4. *A complete line* of accessories to best meet the requirements of any toolroom or production operation.
5. *Modification* of basic grinders is available for any special applications.

See these new models before you buy—Through an actual demonstration at your plant you will see what these machines can do on your grinding operations. There is no obligation. Call your local DoALL Store, or write: *The DoALL Co., Des Plaines, Ill.*

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— complete design, construction, accessory, specification data and examples of special modifications. Ask for your copy today.

Model D6-3

DoALL

GR-14

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Granite Surface Plates

Cutting Tools

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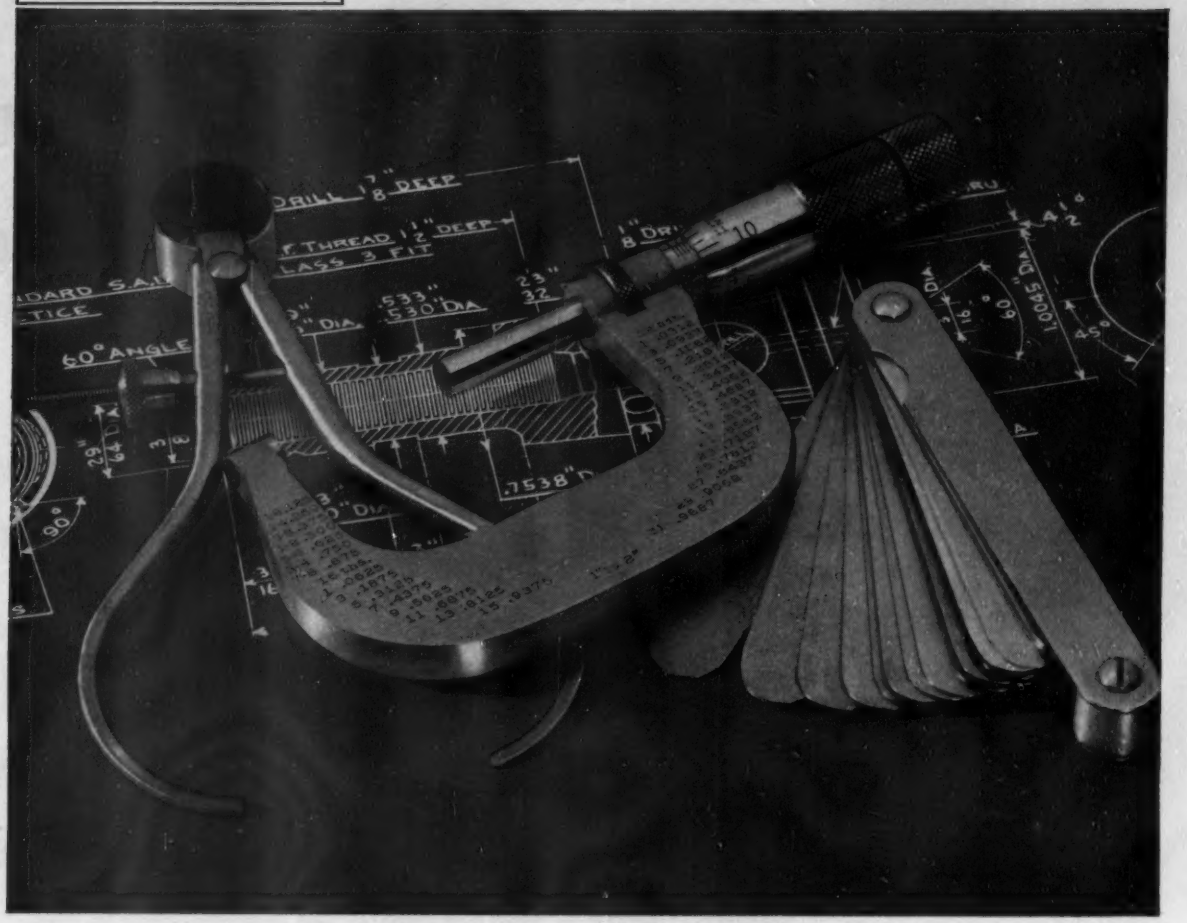
ANTISEP —the heavy-duty cutting base



When close tolerances are a must, you need

ANTISEP

When you're working to close tolerances, Antisep again proves it has the qualities that make it the leader in the field of cutting fluids.

This heavy-duty, fortified cutting base—soluble in water—provides greater lubricity and carries heat away faster than any cutting fluid you can match against it.

Tools stay sharper and last longer with Antisep. Work comes off with minimum distortion cool enough to handle barehanded. And Antisep also has topnotch anti-welding properties that mean freedom from chip build-up on the tool and better finish on the parts.

Try Antisep. Ask the Houghton Man to arrange a trial production run—or write to E. F. Houghton & Co., 303 W. Lehigh Avenue, Philadelphia 33, Pa., for further information.

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the heavy-duty, water-soluble
CUTTING BASE

a product of . . .

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Plenty of Copper..

today and tomorrow

The assurance that copper is in abundant supply and *can be used without restrictions* is the "go ahead" for industry. You can now rate PERFORMANCE over AVAILABILITY when choosing materials. By using copper and its alloys, brass and bronze, your product is easier to fabricate, better and more durable.

We can get more copper than we now have. Although industry and government have been consuming more copper than in any previous peacetime period, production has kept pace with this increased demand. And producers are not working at full capacity!

More copper keeps on coming. Eleven major new projects in the U. S. will start producing in the next 3 years. These mines will add 250,000 tons to our annual production—more than *¼ of all the domestic copper mined during 1953*. In addition, recent improvements in mining techniques now make it possible to obtain copper from ores considered commercially unworkable in the past.

Copper is virtually indestructible. At least 3 out of every 4 pounds of copper used in today's products, when scrapped, can be re-used in the future. Every day we are adding to our "copper capital". The more copper we use . . . the more we have!

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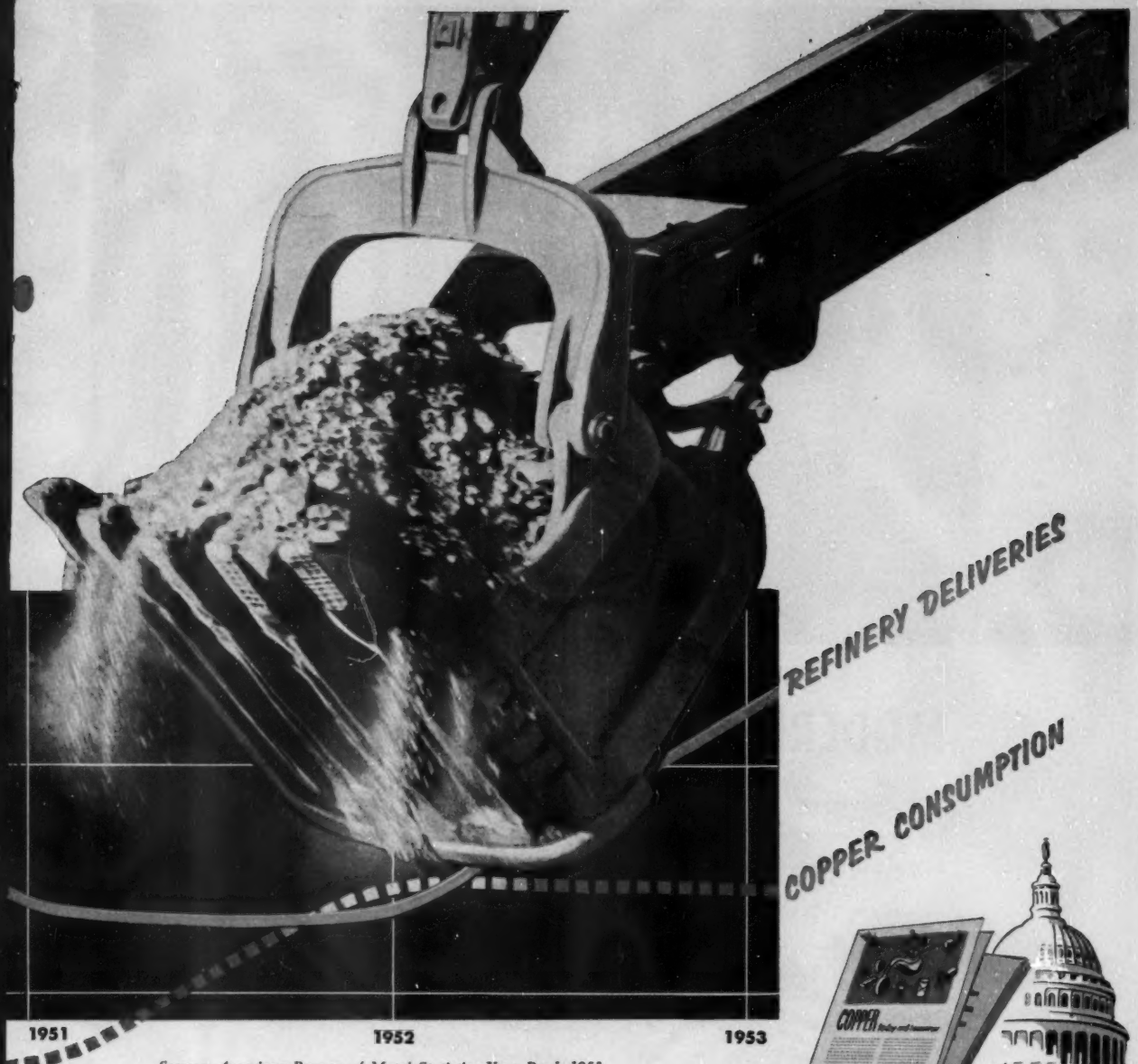
Best conductor of electricity commercially available.

Does not rust . . . high corrosion resistance.

Best heat transfer agent of all commercial metals.

Easy to machine, form, draw, stamp, polish, plate, etc.

Welds readily . . . excellent for soldering and brazing.



Source—American Bureau of Metal Statistics Year Book 1953

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Foreword, U. S. Dept. of Commerce
B.D.S.A. Copper Quarterly, August 1954

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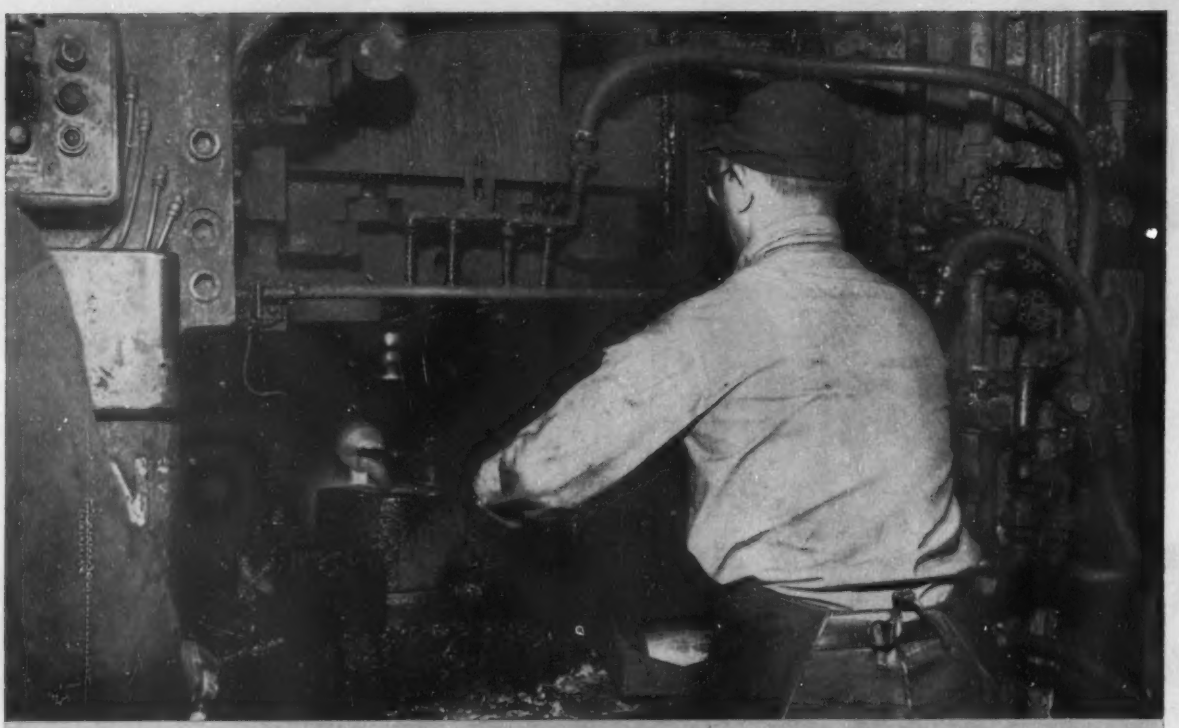

MODERN FORGING AT Ford

This new-design High Speed Forging MAXIPRES is hot-extruding ball-joint suspension forgings at the Ford Motor Co. Forge Plant, one of the world's largest, in Canton, Ohio.

Ford uses 7 MAXIPRESSES, 8 REDUCEROLLS and 24 NATIONAL High Duty Forging Machines—39 units in all—for many of its forgings.

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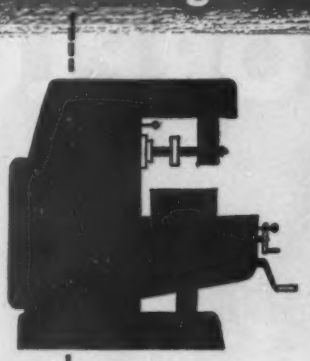

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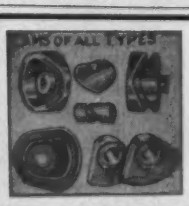
THE DYKEM CO., 2301 B NORTH 11TH ST., ST. LOUIS 6, MO.



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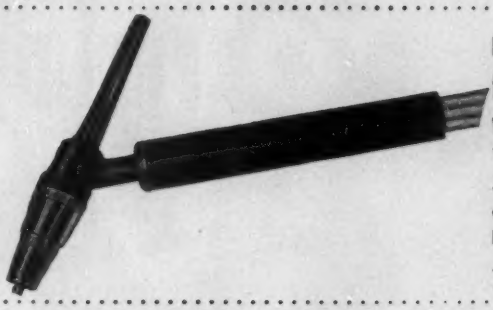

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for heavy-duty welding
Water-cooled—
500 amp. a.c.h.f.,
d.c.s.p., d.c.r.p.
Electrode sizes:
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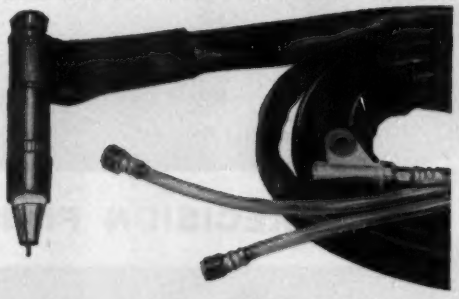

HW-13
for mechanized welding
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20 and 40 g.p.m. models — 40 g.p.m. model shown.

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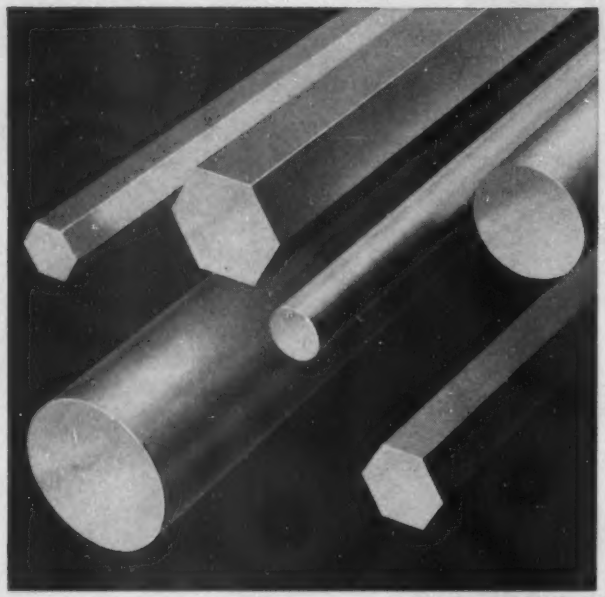
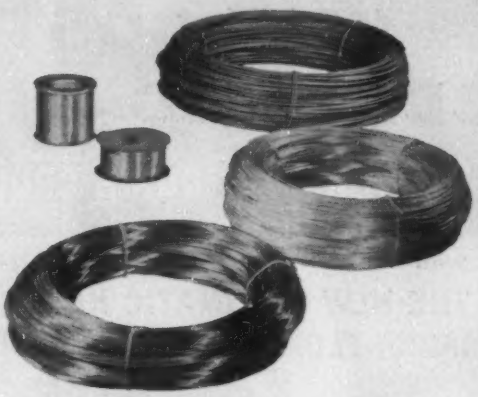
KAISER ALUMINUM PRODUCTS





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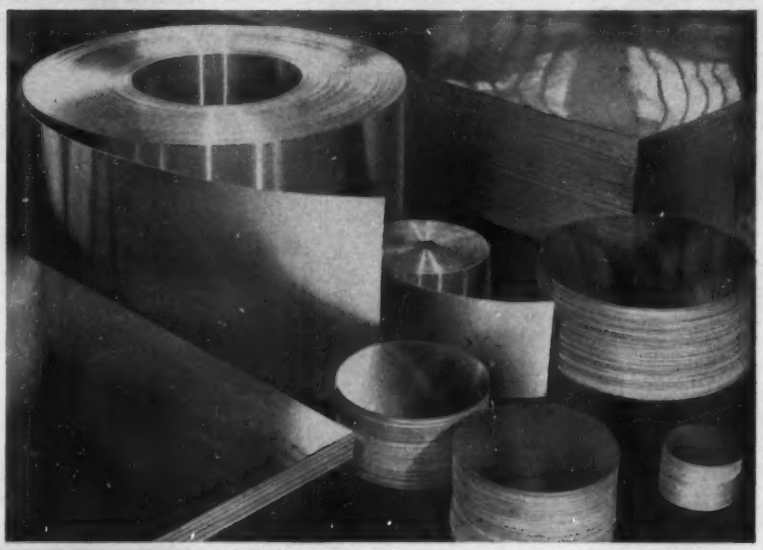

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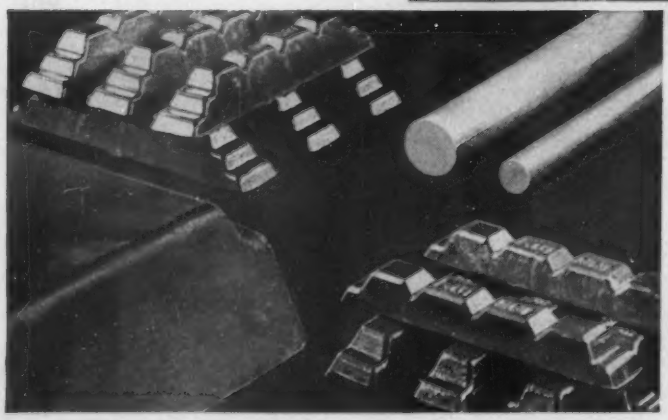
Supplied as flat sheet, plate, coil sheet, circles in a complete range of alloys, sizes and tempers. Specialty sheets available on inquiry.



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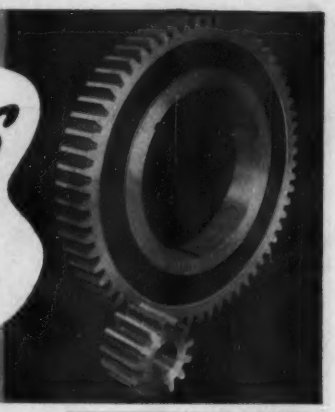
The full Grant line is described in the new catalog recently issued. Write for your copy today!

GRANT GEAR WORKS INC.

169 West Second St., Boston 27, Mass.

Founded in 1872 by George B. Grant the Pioneer Gear Man

Gears for HEAVY INDUSTRY



Stahl craftsmanship supplied this answer to heavy industry's need for a precise, durable spur gear to be used on a 60 ton crane. For similar, or widely varied uses, Stahl has the precision facilities to more than satisfy your gear needs—in any material, in any quantity. Get our estimate.

SPURS TO 72" PD, 1 DP

BEVELS TO 54" PD, 1 DP

SPIRAL, HELICAL and WORM GEARS TO 48" PD, 2 DP

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SPROCKETS TO 72" PD, 2½" CP

RACKS TO 20 FT. LONG, 3 DP

SILENT GEARS; RAWHIDE, BAKELITE, FIBROIL

HEAT-TREATED, CASE OR FLAME HARDENED GEARS — OF CARBON OR ALLOY STEEL

Stahl

GEAR & MACHINE COMPANY

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WORMS & WORM GEARS

•

ALL TYPES AND ALL MATERIALS

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BILGRAM GEAR & MACHINE WORKS

1217-35 Spring Garden, Philadelphia, Pa.

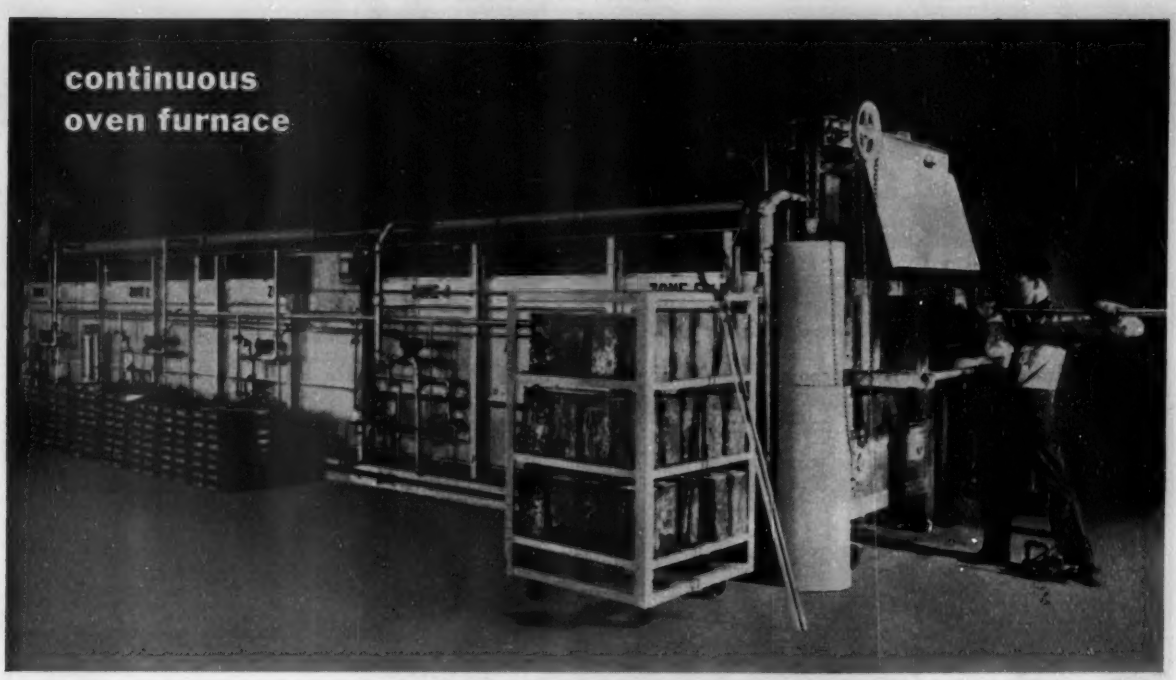
HIGH QUALITY

spiral bevel gears

- Heat treated and lapped in matched sets for high speed operation.
- Pitch diameter 2.5" to 14"
- Diametral Pitch 3 to 7
- Production lots only
- Submit prints for estimates

AMARILLO GEAR WORKS

215 N. Polk St. Amarillo, Texas



speeds investment mold heating with closer control

Investment casters speed up production and eliminate the risks of distortion, cracking, and excessive mold expansion during burnout operations with 'Surface' double-end, pusher-type, large oven furnaces.

There are 5 good reasons for this:

1. uniform heating. No rejects due to spotty heating. This is a result of 50 years of combustion engineering behind 'Surface' equipment.

2. time-temperature cycle control. 'Surface' furnaces are zoned to provide the time-temperature cycle required for your process.

3. simple burner control. The one-valve control of 'Surface' burners makes it simple to achieve a combination of zones of oxidizing and neutral atmospheres.

4. fuel economy. Automatic-proportioning burners save fuel by assuring correct gas-air ratios.

5. equipment for any requirements. Whatever your flask sizes or work volume, there is 'Surface' Standard-Rated equipment to handle the job.

Units up to 40 feet long now in use. 'Surface' furnaces pay off for investment mold heating at low cost. Write for Literature Group H54-9.

Surface
HEAT TREATING EQUIPMENT

SURFACE COMBUSTION CORPORATION • TOLEDO 1, OHIO

ALSO MAKERS OF
Kathabar HUMIDITY CONDITIONING *Janitrol* AUTOMATIC SPACE HEATING

Lapping For Precision Flatness and Parallelity in Production Quantities

. . . with a LAPMASTER

This is the machine for you if you want precision flatness in production quantities at low cost. Lapmasters readily lap to the extreme close tolerance of one light band (.0000116") or less. In addition they produce an extremely fine finish to as low as 1 RMS. They are available with 12", 24", 48", 72" or 84" lapping plates.

This is how the Lapmaster works

Those are some of the features of the Lapmaster

4

Loose abrasive distributed evenly over lapping area insured uniform results.

Another Feature— Lapping Shoulders

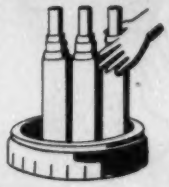
FREE Additional Facts

Lapmaster® DIVISION

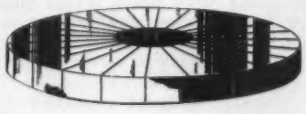
I, a heavy cast iron lap plate revolved slowly under power. **II,** large cast iron conditioning rings are held in position and rotate freely on the lap. **III,** work pieces are placed inside the conditioning ring where they also rotate on the lap. **IV,** a liquid vehicle containing fine loose abrasive flows on the lap plate and is uniformly distributed under the work pieces. At the same time the rotating conditioning rings preserve the flatness of the lap plate. These three essential features, combined with the rapid cutting action of loose abrasive produces a flatness which meets every production requirement.

1 Operator requires no previous lapping experience.

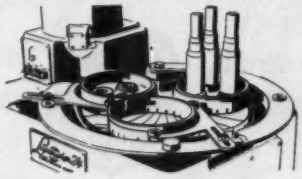
2 Lapping with loose abrasive and without excessive pressure eliminates heat and subsequent distortion.



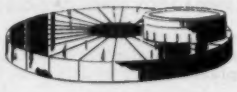
3 Simplicity of design provides accessibility and allows ease of loading and unloading.



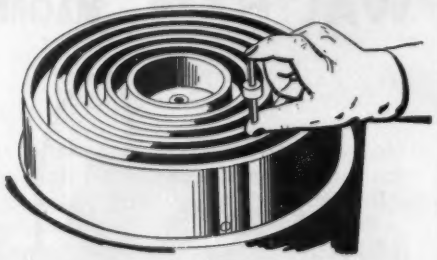
5 Serrated lap plate collects and disposes of spent compound and removed stock, also helps dissipate heat.



6 Precision laps identical parts in one cycle or parts of various shapes, heights and materials in one cycle.



7 Lap plate always kept in condition while in operation. No down time required for truing or reconditioning.



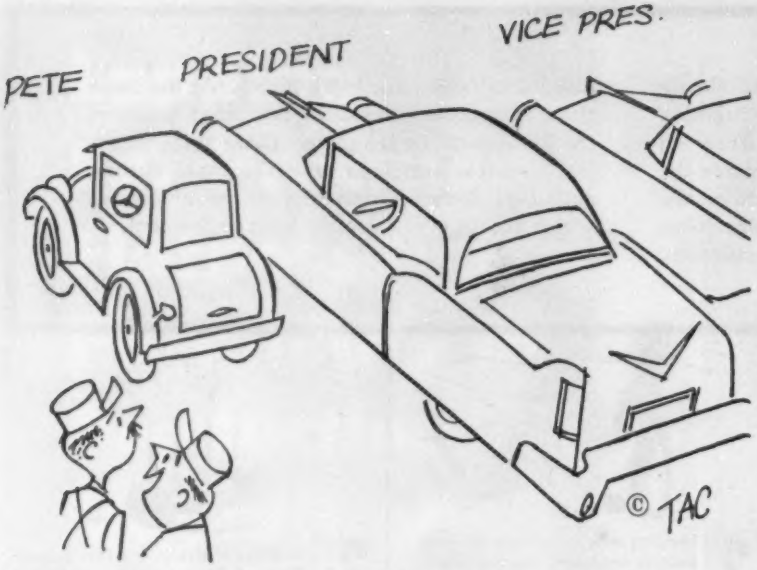
Lapping shoulders, heretofore impossible, is easily accomplished by providing the lapping plate with annular grooves. Conditioning rings are spring loaded.

Learn more about the possibilities of production lapping and the interesting subject of measuring flatness. The illustrated fact-filled booklets are yours for the asking. Write today. Ask for Bulletin AM-9.

CRANE PACKING COMPANY, 1836 Cuyler Ave., Chicago 13, Ill.
In Canada: Crane Packing Company Ltd., 617 Parkdale Ave. N. Hamilton, Ont.

Protected by U.S. and foreign patents.

CRANE PACKING COMPANY



"Pete's been close to the 'Old Man' ever since he suggested Columbia MOLITE High Speed Steel!"

COLUMBIA TOOL STEEL COMPANY • CHICAGO HEIGHTS, ILL.

Producers of fine tool steels — All types immediately available through Sales Offices, Warehouses and Representatives in Principal Cities.

TOOL COLUMBIA STEELS

Does jobs no drill can do! *up to 10 Times Faster than Boring!*

NEW Clark "HOLE-MAKER"

Totally new—maximum rigidity, no chatter! Roughs or finishes holes to exact size in FORGINGS, CASTINGS, BOILER PLATE, THIN STOCK, TUBING; CROWNED, CYLINDRICAL AND FLAT SURFACES. One of 3 blades is *always* in the cut on odd work shapes—*smooth action even on intermittent cuts!* Use new HOLE-MAKERS in radial drills, drill presses, turret lathes, portable electric or pneumatic drills, etc. Excellent for trepanning and rough boring I.D.'s in Tubing, Castings, etc...a real production tool!

Holes can't drift, spindle can't deflect—it's piloted 2 ways!

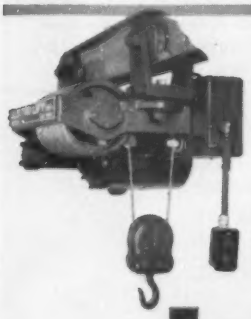
Cuts steels, plastics, transite, non ferrous metals, stainless steel, etc!

5 ADJUSTABLE SIZES: Specify Straight Shank or M.T. 2. 3. 4. Other tapers on order.

Models:	102	203	304	405	506
Capacity:	1" to 2"	2" to 3"	3" to 4"	4" to 5"	5" to 6"

Order from your dealer or write for catalog!

ROBERT H. CLARK COMPANY
9330 Santa Monica Blvd., Beverly Hills, Calif.



pick up production with ELECTROLIFT

This is the worm drive hoist that will give your production a big lift. ElectroLift moves materials through your plant with greater speed, safety and efficiency than any crew.

A wide variety of one-man models is available in sizes up to 6 tons. All are designed to operate with low headroom and have optional pushbutton or rope control.

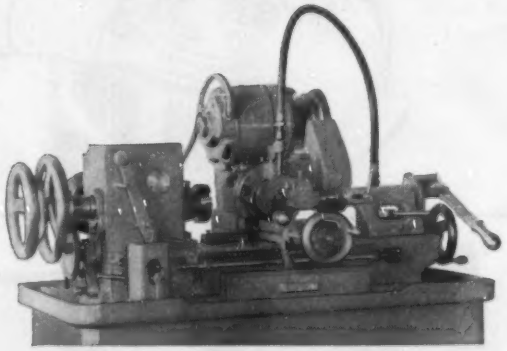
For full details on the features of ElectroLift consult your ElectroLift representative listed in telephone directory or write:

WORM DRIVE ELECTROLIFT HOISTS

ElectroLift, Inc.
204 Sargeant Avenue
Clifton, N. J.

2177

IMPROVED **THREAD MILLING WALTHAM MACHINES**

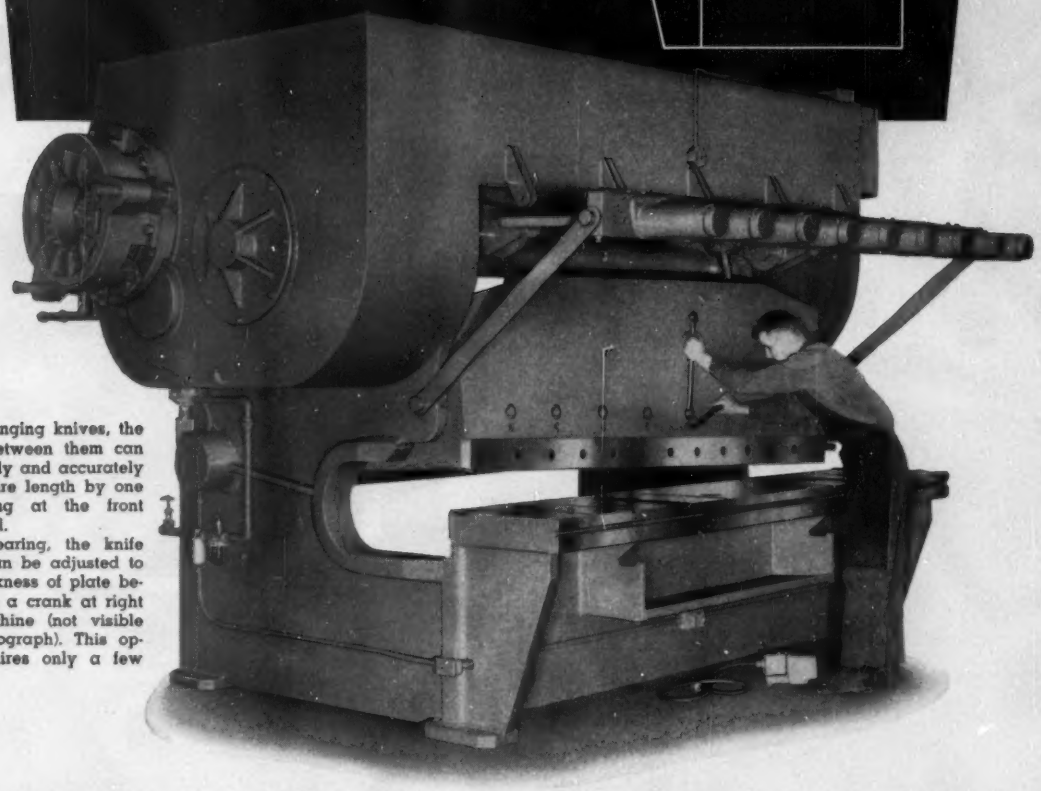


Several improvements in design have recently been made that are not mentioned in our descriptive bulletin. Send for supplementary sheet that lists these improvements and presents an illustration of the whole machine.

WALTHAM MACHINE WORKS, INC.
HIGH STREET, WALTHAM, MASSACHUSETTS

Knife Adjustment...

Easy and Convenient on STEELWELD SHEARS



When changing knives, the clearance between them can be set quickly and accurately for their entire length by one man working at the front as illustrated.

When shearing, the knife clearance can be adjusted to suit the thickness of plate being cut with a crank at right end of machine (not visible in this photograph). This operation requires only a few seconds.

When the knives on a Steelweld Shear are being set parallel from one end to the other, it is not necessary to have one man at the rear of the machine turning adjustment bolts, with another man at the front gauging the knife clearance. Nor is it necessary to work between or behind the hold-downs in hard-to-reach places.

On Steelwelds the hold-down beam can be lifted out of the way and all knife adjustment bolts reached from the front of the machine. As each bolt is turned, the clearance can be checked at once. One man can make the entire adjustment in a small fraction of the time usually required.

After the knives have been set for parallel, the clearance between them can be adjusted to suit various plate thicknesses to obtain the best possible cuts. This can be done in a few seconds by turning a crank and watching a dial indicator.

Because knife adjustments have been made so convenient on Steelwelds, shear operators will make them gladly and without hesitation. This contributes greatly to accuracy and quality of cuts and assures long knife life.

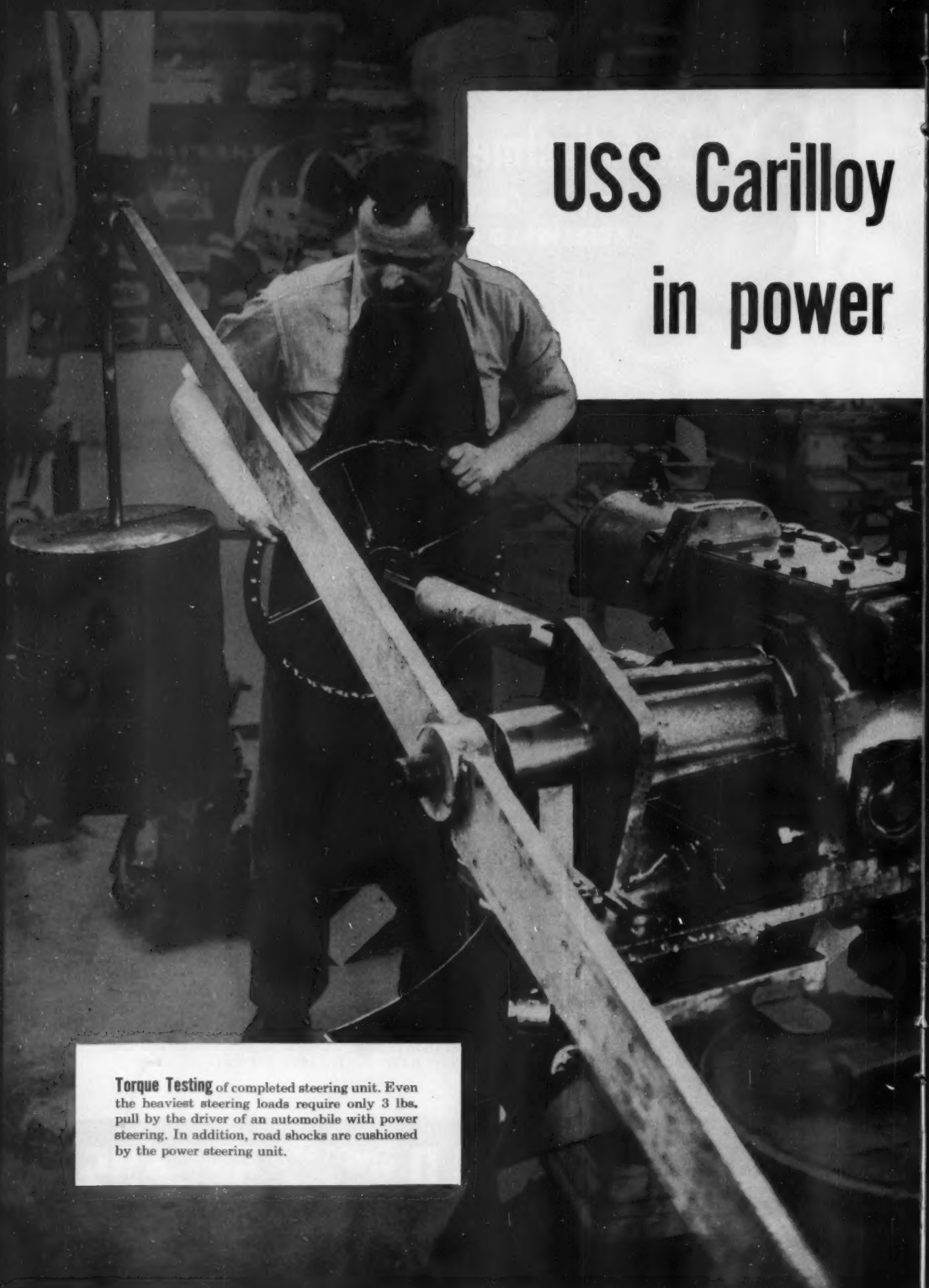
GET THIS BOOK!

CATALOG No. 2011 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.
1438 EAST 282ND STREET, WICKLIFFE, OHIO

STEELWELD PIVOTED BLADE SHEARS

USS Carilloy in power



Torque Testing of completed steering unit. Even the heaviest steering loads require only 3 lbs. pull by the driver of an automobile with power steering. In addition, road shocks are cushioned by the power steering unit.

steels minimize distortion steering units for cars

POWER steering units are precision machines. Every part must fit exactly. Parts must be interchangeable. They must be made to finished tolerances as small as .0001". They must be heat treated with minimum distortion.

These rigid requirements dictate the use of accurately controlled *alloy* steels that can be *quenched in oil.* These steels must respond uniformly to heat treatment, time after time, so that many thousands of parts can be made—*all exactly alike.* USS CARILLOY steels are used extensively in power steering units because they help to insure the uniformity that is essential in all critical parts.

CARILLOY steels are giving excellent service daily in a wide variety of precision parts for automobiles, aircraft, trucks, farm equipment, construction machinery, rotating machines, and many other applications. These high quality steels are meeting some of the toughest requirements known to industry. They can meet yours. Write to United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

UNITED STATES STEEL CORPORATION, PITTSBURGH • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

Worm Shafts are ground to within .0005". Alloy steel must be used for these parts so they can be quenched in oil with a minimum of distortion to maintain the close tolerances.

Heat Treatment USS CARILLOY steels have the uniformity in response to heat treatment that is so necessary to obtain the high strength, adequate ductility and minimum of distortion required in power steering units.

Carilloy USS Steels

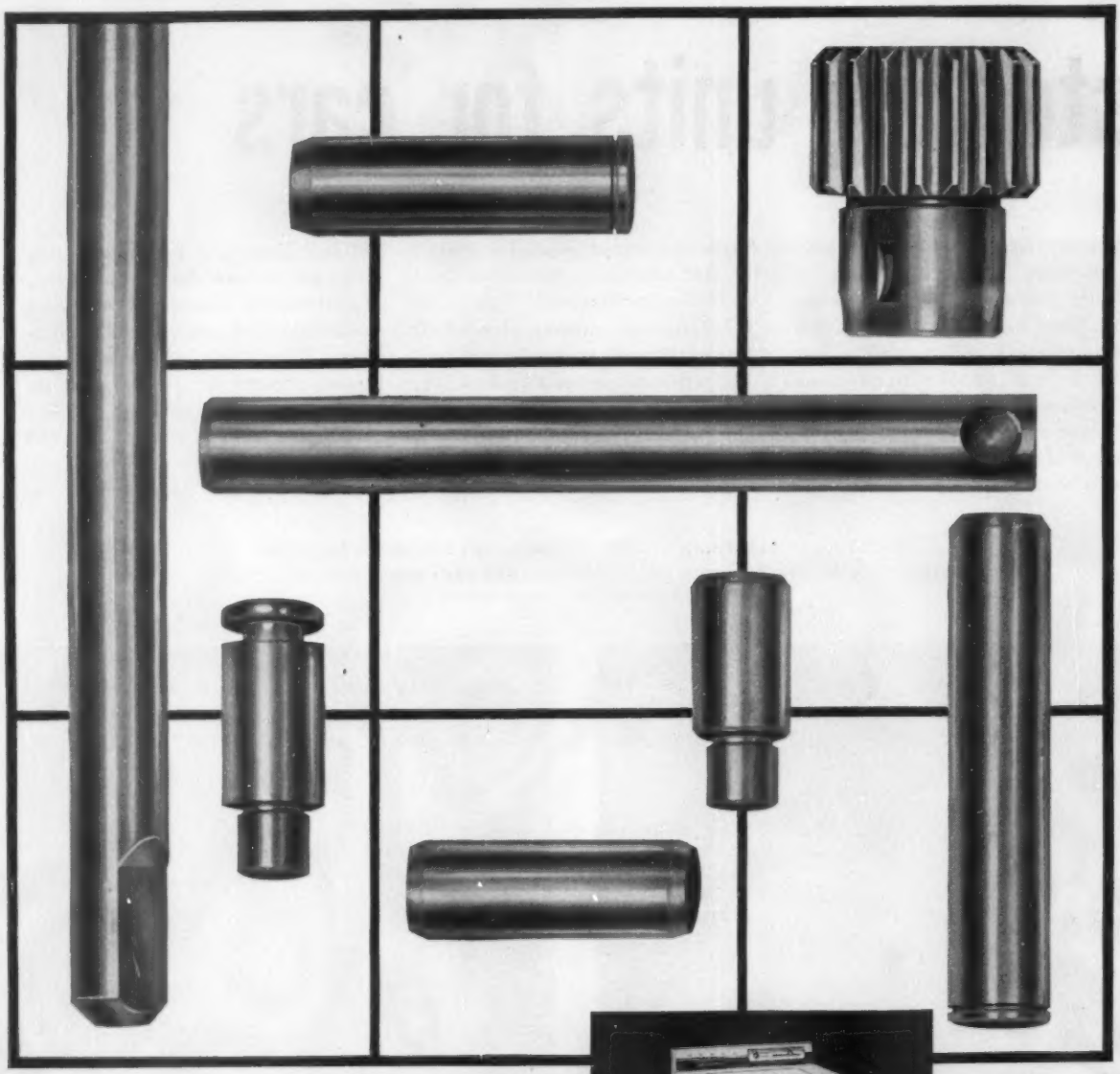
ELECTRIC FURNACE OR OPEN HEARTH

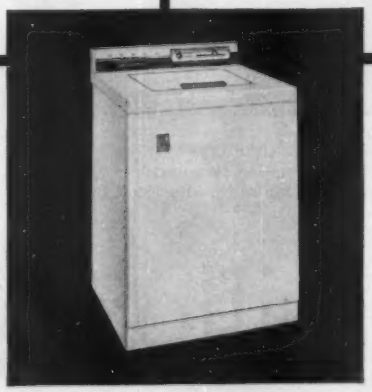
COMPLETE PRODUCTION FACILITIES IN CHICAGO OR PITTSBURGH

4-

UNITED STATES STEEL

How Norge





The parts above are made from Republic Cold Drawn Carbon Corrected Bars. They are used in the top-rated Norge Automatic Washer, Model AW450, manufactured by the Norge Division of Borg-Warner Corporation.

reduced costs 16%

with

REPUBLIC COLD DRAWN CARBON CORRECTED BARS

These parts go into the new Norge Automatic Washer, Model AW 450. They were being made from C-1117 Cold Drawn Steel. Production on the parts was good. But, they had to be trucked to a nearby city for carburizing. This increased unit cost.

Republic Metallurgical Service was asked for advice on how to cut unit cost and still maintain production. After careful consideration of all factors, a switch to Republic Cold Drawn Carbon Corrected Steel was recommended.

Machining and tooling alterations were worked out through close cooperation between Norge Engineers and a Republic Machining Specialist.

Here are the benefits Norge is receiving as a direct result of switching to Republic Cold Drawn Carbon Corrected Bars:

1. The costly carburizing operation has been eliminated.
2. They are getting better machinability.
3. The quality of the parts has been improved.
4. Unit costs have been reduced 16%.

WHAT IS CARBON CORRECTION AND HOW CAN IT HELP YOU?

Carbon correction is the restoration of carbon lost from the bar surface during hot rolling. This lost carbon is restored right out to the edge of the bar through annealing in a controlled carbon-rich atmosphere prior to cold drawing.

Carbon Corrected Bars are ideally suited for your steel parts which must have high surface hardness —particularly those produced by both high and low frequency induction heating.

Using Republic Cold Drawn Carbon Corrected Bars eliminates waste, both in metal and money. It's not necessary to machine or grind away the surface to remove "decarb". You eliminate buying bars oversize to allow for surface removal. You get better MACHINABILITY.

Our metallurgists and machining specialists are ready to help you use Republic Cold Drawn Carbon Corrected Bars to the best advantage.

Call your nearby Republic District Sales Office.

REPUBLIC STEEL CORPORATION

Union Drawn Steel Division • Massillon, Ohio

GENERAL OFFICES • CLEVELAND 1, OHIO

Export Department: Chrysler Building, New York 17, New York

REPUBLIC *Union* COLD DRAWN STEELS

REPUBLIC STEEL

Free-Machining Bessemer, Alloy and Enduro Stainless Steels • Union Cold Drawn Special Sections • Union Cold Drawn and Ground Rounds, Turned and Polished Rounds, and Turned, Ground and Polished Rounds

YESTERDAY'S PIONEER . . . TODAY'S LEADER

WELDON

Stub Length Double-End End Mills

Stock Items

This line of small size end mills, in both double-end and single-end, with flutes shorter than regular, provides the following advantages:

GREATER STRENGTH
LONGER TOOL LIFE
FAR LESS BREAKAGE
FASTER FEEDS

Furnished in 2- and 4-flute styles

Weldon distributors throughout U. S. A. and Canada carry complete stocks to serve you

THE WELDON TOOL COMPANY

3000 WOODHILL ROAD . . . CLEVELAND 4, OHIO

TOOL ENGINEERS and TOOL MAKERS

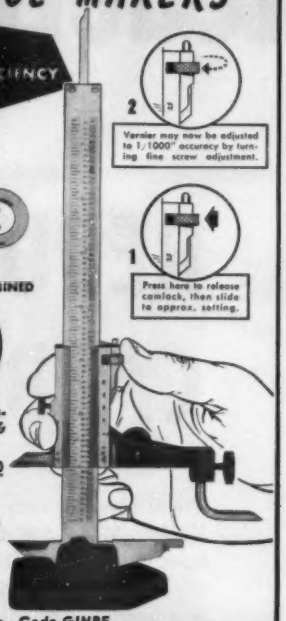
HERE IS A NEW TOOL TO STUDY. HIGHEST STANDARD OF EFFICIENCY AND ACCURACY UNRIVALLED IN PRICE AND VALUE

It's the NEW

MICRO LOCK

QUICK CAMLOCK + MICRO FINE ADJUSTMENT COMBINED

made by the FAMOUS **MAUSER**


2
Vernier may now be adjusted to 1/1000" accuracy by turning fine screw adjustment.
1
Press here to release camlock, then slide to approx. setting.

SPECIFICATIONS
Total Length: 9" - Measuring Capacity: 6" - Graduations: 1/1000" & 1/128" - Code Word: GINDO

Without detachable Height Gauge Base and Scriber — $25.50

Same as above but with detachable Base and Scriber - Code GINFU — $33.50

SOLD ON A 10-DAY MONEY BACK GUARANTEE

Send for Folder - Code GINRE

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LUERS Patented Cutting Off Tool Holders · Patented Cutting Off Blades

ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY

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NOT This — But This

When Your Punch Press Operators Use

SAFEED *Patented*

Fully Guaranteed

PREVENTS INJURY — Saves Glove Costs. Feeds ferrous, non-ferrous strip or sheet . . . faster, safer. Use for stamping, shearing. Right or left hand non-slip fitted grip, self - adjusting. Sturdy hardened work surfaces.

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AFFILIATED MACHINE & TOOL COMPANY
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HIGH PRODUCTION MILLING

on REED-PRENTICE No. 4 MILLER

Whether you have a rough milling operation requiring extra ruggedness or a complex part to accurately duplicate, you can confidently route the job to a Reed-Prentice No. 4 Vertical Milling machine.

Massively constructed for rigidity and precision, this machine features infinitely variable **electronic** feed drive for table, cross slide and vertical slide. One, two or three dimension tracer control systems can be furnished on either 60" or 96" No. 4 Millers.

Milling large steel castings on No. 4 Miller with 8" carbide cutter

Reed-Prentice 96" No. 4 "Electronic" Miller with two-dimensional General Electric contour follower unit

SPECIFICATIONS	#4-60"	#4-96"
Longitudinal travel of table	60"	96"
Travel of cross slide	24"	24"
Table working surface	24 x 96"	24 x 132"
Feed range	½ to 25" per minute	
Spindle speeds: 20 HP motor	45-1800 RPM	
25 or 30 HP motor	90-1800 RPM	

Write for Bulletin #6096 giving full information on 60" and 96" Reed-Prentice No. 4 Millers

MAIN OFFICE 677 Cambridge St., Worcester 4, Mass.

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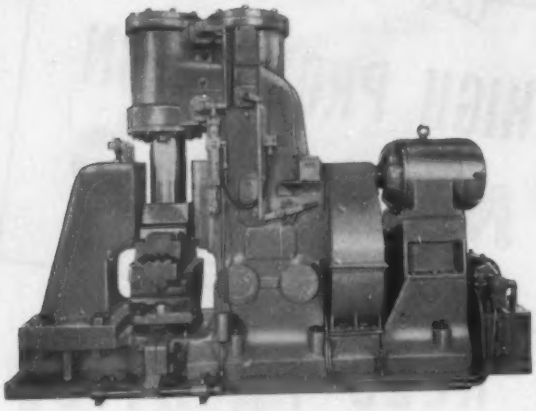
does everything but talk...



this new **NAZEL** ELECTRO-PNEUMATIC No. 6 "Type C"

forging hammer

just look at these features!

- Outboard Ram Guide, which allows both open and closed die forging and insures positive die mating . . . Anvil is mated to base for exact register.
- Die capacity is exceptionally large. Upper die shown is 14" by 40" by 7".
- Hydraulic Power Control . . . gives "feather touch" treadle or hand control changeable or removable for convenience.
- Light to heavy blow at touch of Control to suit job. Coining, planishing or forging.
- Direct Power Drive, with pinion running in oil for longer life.
- Modern Lubrication to *all* moving parts.
- Completely self-contained!
- This *new* NAZEL No. 6 "Type-C" is a floating ram hammer at its best . . . designed for continuous production, proper forging ratio . . . and, it is *economical!*
- Bridgeport Knife and Facing Grinders
- Nazel Forging Hammers
- Dill Slotters
- Cold Cutting Friction Saws
- Abrasive Cut-Off Saws

Further details are yours upon request.

LOBDELL UNITED COMPANY

1836 WILMINGTON 99, DELAWARE 1954

A SUBSIDIARY OF UNITED ENGINEERING AND FOUNDRY COMPANY

PRECISE
hole location, easy
contour inspection
with *new* machine
tool microscope

Any machine shop, large or small, can save time and money on milling and boring work with the new Perkin-Elmer Model 11 Machine Tool Microscope. For hole location, its wide field of view (¼") or 30x magnification makes it possible to gage accurately to a ten thousandth —*at a glance.*

Mount the Model 11 on an offset bracket or directly in the spindle—it will fit nearly any machine tool.

When offset it can be used for transferring hole locations from template to workpiece. The image always appears erect and moves in the same direction as the work, making it ideal for checking contours, slots, surface conditions. The Model 11 Microscope is compact, sturdy, rugged—designed for long life, accurate service.

Write today for complete details.

THE PERKIN-ELMER CORPORATION, NORWALK, CONN.

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Sensitive Drilling and Tapping Machines for Economy and High Production

Capacities to 1½"

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Affiliated with Precision Castings Co. Inc. Cortland, New York

DAVIS KEYSEATER

This low cost machine will handle internal keyseating jobs up to 1 in.

Write for illustrated bulletin.

DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

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WHO'S WHO

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Making the finest

COUPLING BOLTS CAP SCREWS

MILLED STUDS SET SCREWS

. . . our specialty

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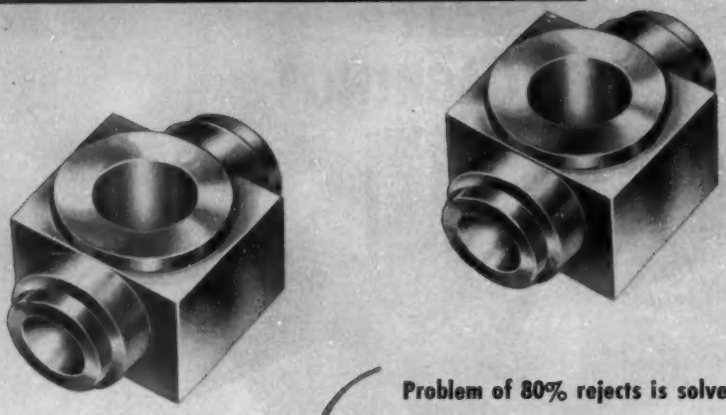
Ottemiller products are sold through Mill Supply Houses and Industrial Distributors.

2 Stainless Parts . . . *look alike*



but with 1 of them

Problem of 80% rejects is solved

This is a precision part for a military bombsight. Some of the tolerances are ±.0001". Dependability is a "must". Every factor has to be "on the nose". Yet when the subcontractor used several ordinary Type 416 Stainless steels, rejects ran as high as 80%. But then he made one change . . . to Carpenter No. 5 (Type 416) . . . and eliminated the problem.

Tool life increases

Also, tool life was short, machine downtime excessive, and production was lagging. Then one change was made—to Carpenter Stainless No. 5—and machining time was shortened, tool life raised to a trouble-free level.

Production jumps

With Carpenter No. 5 production of this part is up to schedule because the reject problem has disappeared, machining time stepped up and tool life increased. Here is just one more example of how *Carpenter quality* makes a real difference in stainless fabrication. The next time you order stainless, be sure it's Carpenter. Watch it speed production—ease headaches from first operation to the last.

Make the <u>one</u> change that counts . . .

change to *Carpenter* STEEL

Free-Machining Stainless

take the problems out of production

THE CARPENTER STEEL COMPANY, 109 W. Bern St., Reading, Pa.
Export Department: The Carpenter Steel Co., Port Washington, N.Y.—"CARSTEELCO"

For fast delivery, call your nearest Carpenter Mill-Branch Warehouse, Office or Distributor

Another ACME CONTRIBUTION ... to Economical BROACHING!

HORIZONTAL HYDRAULIC MACHINE . . . Specially *DESIGNEERED for Oil Well and Field Equipment!

• Basically, an Acme H-25T-66S Horizontal Hydraulic Machine with special fixture arrangement and oil pan to accommodate a variety of large and heavy crank arms for use in oil field pumping units. These arms require keyways for driving purposes and are made in various lengths and sizes . . . The large upright casting above the work part is lined with hardened and ground ways, and by inserting a machined plug in the upper end of these arms, this facilitates vertical alignment of various lengths of crank arms. The large bore at the lower end slips over hardened and ground interchangeable plugs to accommodate various bore sizes and these plugs have ground slots to guide the broach . . . In this case, where production of each size part was low, the use of the simple universal fixturing arrangement so that all sizes of crank arms could be keyway broached on a single machine resulted in substantial economies.

LET US SUBMIT RECOMMENDATIONS ON YOUR BROACHING EQUIPMENT REQUIREMENTS

Write Today!

*DESIGNEERED . . . An ABC word coined to describe the creative design-engineering inherent in every product made by Acme Broach Corp.

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MILAN, MICHIGAN

TUBE END FORMING MACHINERY

for

Beading—Flaring—Flanging—Expanding—Reducing —Sinking—Swaging—Grooving—Double Lap Flaring and Flanging 1/8" to 4 1/2" TUBING

Write for General Bulletin G-3

VAILL *Engineering Company*

137 E. MAIN ST., Rear WATERBURY 20, CONN.

New Lathes Boost Production 255%

Garwood Industries, Inc., installed two modern automatic lathes for turning worm shafts. These machines, with one man operating both, put 2 pieces on the floor every 4 minutes, 9 seconds. They replaced two machines (both operated by one man) which put 2 pieces on the floor every 14 minutes, 45 seconds. Production increase: 255%.

This dramatic example of time and labor savings accomplished by modern shop equipment is but one of hundreds cited in your 1954 PRODUCTION PLANBOOK for Metalworking. You can profit from these successful cases.

The new PLANBOOK, which you received in November as part of your regular *American Machinist* subscription, contains hundreds of pages of new facts on how you can increase your plant efficiency through modernization . . . *when* you should replace a piece of equipment . . . how plants all over the nation have profited from the replacement of obsolete machinery, and how you can, too. Featured is a new *American Machinist* Inventory of Metalworking Production Equipment, with detailed information on how much metalworking equipment is in use, *where* it is, and *how old* it is. Make good use of your PLANBOOK. It is worth money to you.

The PRODUCTION PLANBOOK for Metalworking

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FAFT
204 147,5 mm.
COMBINED MACHINE

Milling and Boring Machine FAFT 147,5 mm. equipped whith swivelling arm, turning head and rotary table for turning, milling and dividing; working as normal milling and boring machine with eclipsable arm, and as vertical turning and boring machine with arm in working position.

Power available in the milling cutter: 40 HP.

Automatic cycles, precision stops on all movements, including rotary table, through electric control.

Pendant box controlling all feeding or rotation movements, either simultaneous or separate, spindle speed selection, locking of carriage and table.

Possibility of equipping swivelling arm with vertical milling and boring headstock.

Spindle speed (stepless range) 1,3 to 640 rpm.

Weight: 100 tons.

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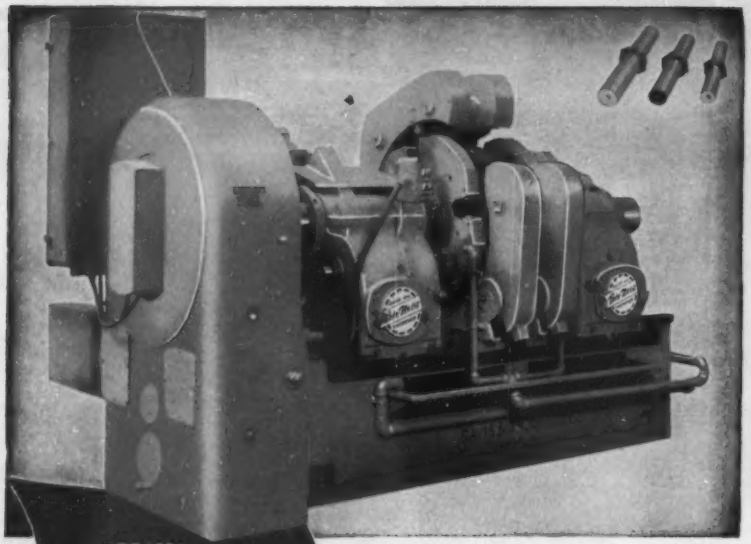
MILAN NEW YORK PARIS
Information and literature from: Innocenti Corporation, 350 Fifth Avenue, New York 1, N.Y.



Milling and Centering Simultaneously and in Continuous Production

Here's an excellent example of how two entirely different operations can be combined on one machine. This Davis and Thompson continuous type Roto-Matic both mills and centers on both ends in one operation. Rough and finish milling cuts on the ends of the shaft and centering of both ends is completed with only one rotation of the fixture drum. The centering heads travel with the work station until centering operation is complete then drop back to next work station and repeat. Automatic equalizing clamping is provided to the fixture. Spindles have micrometric adjustment and spindle carriers are adjustable on the ways to accommodate shafts of various lengths.

FREE DATA on this and other Davis and Thompson machines is available in our bulletin No. 1000.

Roto-Matic

Davis and Thompson Co.

4460 N. 124th ST. MILWAUKEE 16, WISCONSIN

Modern Lathes Speed Production Up to 400%

One new hand-operated vertical turret lathe is 30 to 35% more productive than its predecessor of ten years ago. If the operator and the job permit use of set stops and higher modern spindle speeds, the percentage is boosted still higher. And, if an indexing control machine is applied to the same job, increases will be 300 to 400%!

Such facts as these, detailed and authoritative, are available to you by the thousands in your 1954 PRODUCTION PLANBOOK for Metalworking. The new PLANBOOK, which came to you in November as part of your regular *American Machinist* subscription, provides you with more valuable data on modernization and replacement than can be found in any other single source.

Methods for determining when it becomes advantageous to replace machines in your shop are shown . . . hundreds of case histories, bolstered with actual figures, tell how successful modernization programs have been carried on . . . the big, new *American Machinist* Inventory of Metalworking Production Equipment tells you how much metalworking equipment is in use in the nation, where it is, and how old it is. You can determine where your shop stands in relation to the overall picture.

Take full advantage of the wealth of information in your 1954 PLANBOOK. Read it thoroughly, and keep it handy for regular reference.

The PRODUCTION PLANBOOK for Metalworking

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Save your large JIG BORERS for large jobs . . . put small precision work on the LINLEY . . .

The Linley Jig Borer provides the means . . . at very low cost . . . of handling your most exacting requirements in precision. With it you can cut costs through having a tool exactly fitted to your small work . . . save your larger machines for larger work.

Specifications

Table Movement: 6" x 10" Table Size: 7" x 17½"

Send for complete information TODAY!

LINLEY BROTHERS CO.

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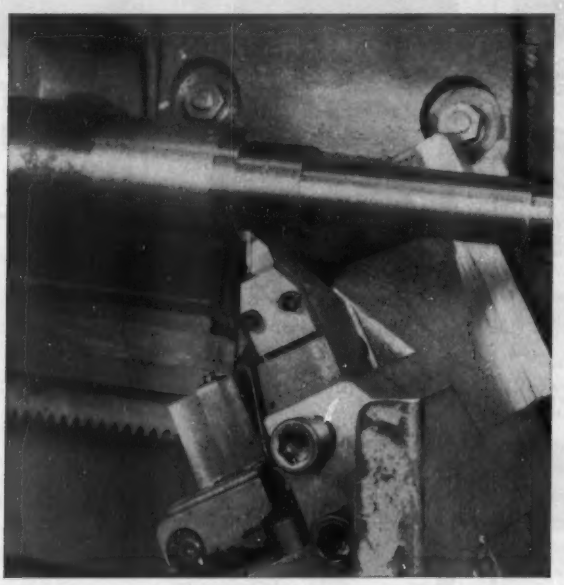
. . . a performance report on another Kennametal grade with ideas you can use to cut machining costs



New Kennametal profiling tool, with clamped K4H grade insert, machining pinion gear blank on New Britain + GF + Copying Lathe. The Lathe's hydraulic system operates the copying slide and actuates several automatic functions.

100% increase in surface speed on New Britain +GF+ Copying Lathe with new Kennametal* K4H Profiling Tool

A series of tests were run to determine which tooling would best utilize the performance potential of this New Britain +GF+ Copying Lathe in profiling SAE 8720 steel pinion gear blanks.

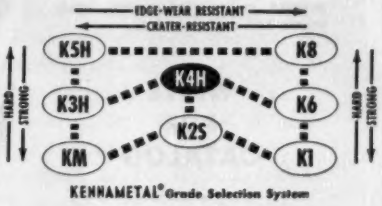
With K4H inserts clamped in new Kennametal PT Style Tools, these tough pinion forgings were profiled at 850 RPM. The machining time averaged 32 seconds, holding plus or minus 0.001 inch on all diameters. The depth of cut on each side was ⅜ inch. An average of 220 pieces were machined per grind.

Prior to testing K4H inserts, the maximum lathe speed practical with standard brazed carbide tools was 425 RPM.

The 100 percent increase in surface speed made possible by the use of K4H inserts permitted fuller utilization of the capabilities of this new, versatile, high speed lathe. A20

*Registered Trademark

K4H is a hard grade with unusually high strength which makes it suitable for roughing scaly, abrasive steel castings and forgings where both edge-wear and crater resistance are required. Versatile K4H is also an excellent grade for interrupted cutting and, when used as a brazed tool, for a variety of finishing operations where the chip load is light.



KENNAMETAL® Grade Selection System

The easy-to-use grade selection guide shows that K4H is harder than K2S—more crater resistant than K6—more edge-wear resistant than K3H. It is an intermediate grade having a wide range of application. Where greater edge-wear or crater resistance is desired, performance can be improved simply by changing to the grade indicated on the guide.

Across the country, over 150 Kennametal Tool Engineers are helping plants solve their machining problems by analyzing tool wear—helping select the tool or grade best suited for the job—conducting in-plant training programs. You'll find Kennametal Offices listed in the classified sections of telephone directories in principal cities. Call your nearest Kennametal Tool Engineer, or write to KENNAMETAL INC., Latrobe, Pa.

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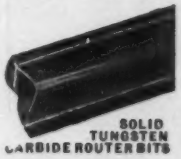
STANDARD TOOLS

SOLID TUNGSTEN CARBIDE REAMERS

TIPPED TWIST DRILLS



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Excellent service on special tools built to your specifications. Send us your prints. You will receive prompt acknowledgement, quotation and delivery date.

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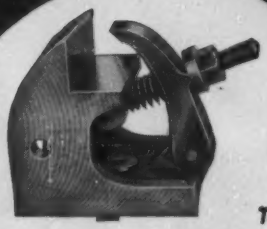

"Masters of A Thousand Set-ups"

Eliminate the need for many special expensive jigs and fixtures.

You will save time and money on most set-ups with Hart Milling Fixtures. They hold round, hexagonal, octagonal or square stock, for miller, shaper, drill press and tapper; they reduce set-up time and speed production. Hart Milling Fixtures are made in four useful sizes, and designed to be used in horizontal or vertical position. Let us send you full description and prices.

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MODEL RC 250

SAJO HYDRAULIC HACKSAW represents the latest addition to the SAJO line of Hacksaws built by Sweden's largest Hacksaw manufacturer. This Heavy Duty 10" x 10" Production Hacksaw incorporates the unique feature developed by SAJO providing instantaneous finger-tip controlled cutting pressure insuring maximum cutting efficiency and saw blade life. Designed for simple fool proof operation and incorporating the sturdy construction and painstaking workmanship on which the SAJO reputation has been earned, the Model RC 250 represents an outstanding value in this type of metalworking equipment. Also available are, SAJO Utility Hacksaws; Model RC 30 6" x 6" and Model RC 45 9" x 9".

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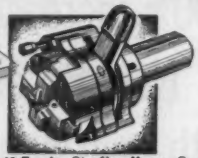

famous for accuracy and straightness of threads, low chaser costs, less downtime, more pieces per day.

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ACROMARK

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MODEL D-1 DIAL TYPE

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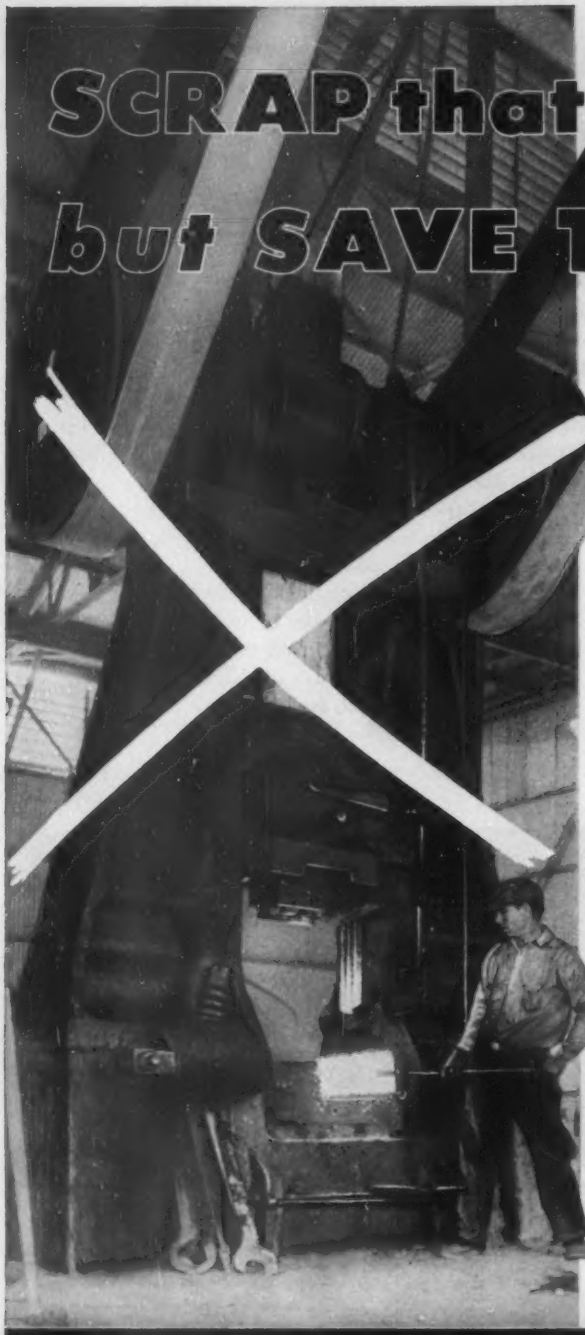
Yes, the *solid base* of several quality car-mirrors is *Bristol Brass* which gives the manufacturer uniform *working* qualities . . . and gives the user uniform *lasting* qualities. And *you* . . . whether you make mirrors or magnetos, or any other product that can profit by using Brass . . . make sure you get *Brass at Its Best* . . . which means Brass strip, rod, and wire from the modern mills here in Bristol.

THE BRISTOL BRASS CORPORATION

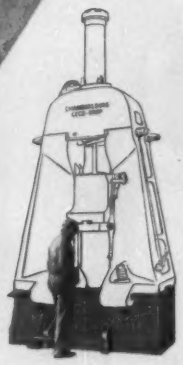
has been making Brass strip, rod and wire here in Bristol, Connecticut since 1850, and has offices and warehouses in Albany, Boston, Buffalo, Chicago, Cleveland, Detroit, Milwaukee, New York, Philadelphia, Providence, Rochester, Syracuse. The Bristol Brass Corporation of California, 1217 East 6th St., Los Angeles 21. The Bristol Brass Corporation of Ohio, 1607 Broadwcy, Dayton.

"Bristol-Fashion" means **Brass at its Best**



SCRAP that old hammer but SAVE THE ANVIL!

MOUNT A CECO-DROP UPPER-WORKS ON IT



To meet competition, your best bet is to scrap your old unproductive gravity drop hammers and install Ceco-Drops, the most modern, most productive drop hammers ever built. And for quick changeover at minimum cost, you can have Ceco-Drop upper-works fitted to your present anvil. You have all the benefits of modernization without the time and expense of replacing the anvil or disturbing the foundation.

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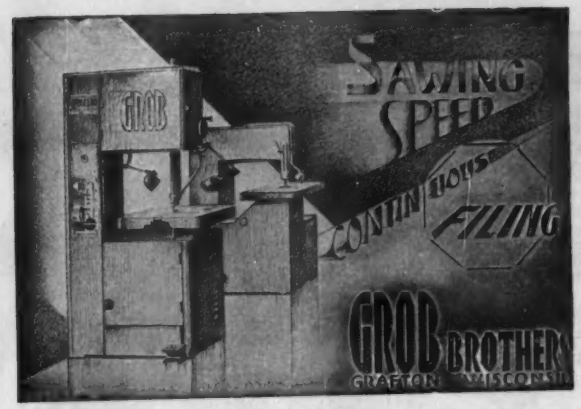
CHAMBERSBURG ENGINEERING CO., CHAMBERSBURG, PA.



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THE GRANT MFG. & MACHINE CO.
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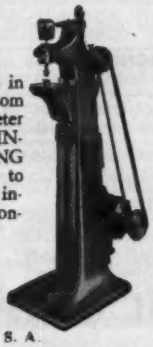

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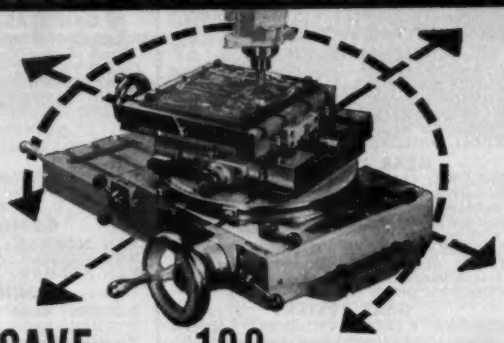

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MANUFACTURERS AGENT desires additional line, Central New Jersey. RA-3659, American Machinist.

SALES REPRESENTATIVE, wants to represent established manufacturer full time of a product used in the machine industry. Must be already established with active accounts in New Jersey, Penna. and Conn., give full particulars. Address Representative, 113 Harrow Road, Westfield, New Jersey.

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We are looking for an aggressive, alert general foreman capable of supervising a large and important production machine shop. The successful applicant must have 10-12 years of machine shop experience with at least 5 years as a foreman. An M. E. degree is preferred but not essential. Experience in directing the efficient operation of turret lathes, multiple spindle screw machines, grinders, and saws is required. Knowledge of M. T. M. and statistical quality control methods will be helpful. Age 35 to 50. Opening is in Midwest. Usual employee benefits are provided, including your moving expenses. Reply

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British medium sized engineering concern whose main products are well known in America can undertake the manufacture, under license, of complete machines up to five tons weight.

Recently installed plant consisting of large turret lathes, large and medium sized milling machines, large planing machines, drilling and cam-milling machines, horizontal and vertical boring machines.

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LEES BRADNER 49A

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BROWN & SHARPE: No. 10 cap. 6"x18" plain
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LANDIS: 16"x32" Type "D" Crankpin, hydraulic, for grinding crankshafts
NORTON: 12"x18" Type C, Universal
NORTON: 10"x36", 30 Deg. Angle Wheel
NORTON: 10"x18" 45° angle wheel

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PRATT & WHITNEY: 10" single and double wheel, hydraulic feed
INTERNAL GEAR GRINDER, GG-31

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HEALD: #50 Planetary
HEALD: #72A3 Sizematic
HEALD: #72A3 & #72A5 Extended Bridge

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VAN NORMAN: #649-16, cap. 6" to 16" dia.
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MICROMATIC: H-510 Double End Horizontal, ¾" to 2" dia.
MICROMATIC: H-2 Single End Horizontal, 2 spindle, ¼" to 1" dia.

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LODGE & SHIPLEY: #3A Duomatic, 25½" swing x 27" centers
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BULLARD: 36" Vertical turret
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LANDIS: 2½" single head horiz. threading machine
LEES-BRADNER: #40A Thread Miller
LEES-BRADNER: CT-36 Thread Miller chucking type, 13½" hole
MURCHEY: #22 Horizontal threading and tapping machine, ½" to 2½" dia. capacity.
NATCO: 16 spindle Tapper ⅝" cap.

MISCELLANEOUS
GARDNER: Model 84A Double Disc Grinder, 23" Wheel
MOLDING MACHINES, ROLLER JOLT: Osborne Model 2047-3
AUTOMATIC SCREW MACHINE, Wickman Single Spindle, 7/16" New
RACK CUTTING MACHINE: Sykes 12" to 36" length capacity (New)
CUT-OFF: Russell 5½" & 9½" cut-off saws with auto. stock feed (new) hydraulic
TEST STAND: Denison 918-AM Hyd.
HARNESS TESTER: Grogan Brinell, 16-8
SHEFFIELD: Precisionaire Gauge
SUNDSTRAND: Double-End, #53, 42" & 60" Centering Mach.
WIRE FORMING MACHINES: 4-slides (new)

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6½" NILES, floor type 14x14' plate
4½" UNIVERSAL, table type
68" x 21' CC BRIDGEFORD, geared head
#11 BLANCHARD, 16" chuck, 1942
#18 BLANCHARD, 36" chuck, 1942
16" x 72" CINCINNATI Plain Cylindrical, 1943
20MB SMALLEY-GENERAL Thread Mill, 1942
24" x 32" x 36 ROCKFORD Openside Planer Shaper
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27"x18' MONARCH "N" Geared Head Lathe, 11' centers, Taper Attach., Full Equipment, Late Type.

24"x12' BOYE & EMMES Timken Bearing, Geared Head, Lathe. Late Type.

27"x16' NILES, BEMENT, & POND Geared Head Lathe, 9' centers, M.D.

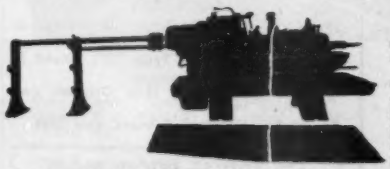
24", 36", 42" BULLARD Vertical Turret Lathe, New Era, Turret Head, Side Head, Motor Driven.

No. 601 W.D. OSTER Motor Driven Turret Lathe, 1½" capacity, Late.

1A WARNER & SWASEY Turret Lathe, Heavy Duty, Power Chuck Wrench, Timken Bearing, M.D.

No. 2, No. 3, No. 5, No. 3A WARNER & SWASEY Geared Head Turret Lathes, Bar Feed, Motor Driven.

24"x10' AXELSON Geared Head, Heavy Duty Model "E" 28" Actual Swing, M.D. Taper Attachment.



No. 7 BARDONS & OLIVER Universal Turret Lathe, 2½" capacity. Preselector Head, Late Type.

No. 00G BROWN & SHARPE High Speed Automatic Screw Machine, Motor Driven, Late type.

No. 1 LaPOINTE Motor Driven Horizontal Broach, 5 tons cap., 38" stroke.

50 HP. CHICAGO PNEUMATIC Air Compressor. Type NSB, 253 CFM, Piston Displacement.

10"x10" RACINE #30-C Hydraulic Heavy Duty Shear Cut Power Hack Saw, 1946.

10'x10 ga., 10'x¼" WYSONG & MILES Power Squaring Shears, Motor Driven.

10'x10 ga. CINCINNATI Power Squaring Shear, many extra features; NEW 1948.

#7A THOMAS open back Inclinable Press 80 Ton cap. Flywheel M.D.

600 ton NILES-BEMENT-POND Motor Driven Wheel Press, 86" between strain rods, 14' cap., 17" diam. ram.

#5, #7 JOHNSON O.B.I. Presses. 56, 79 tons cap. M.D. Flywheel & Geared Type.

MILLING MACHINES

#2-18 CINCINNATI Plain Auto. Milling Machine, M.D. Late Type.

#2 KEMPSMITH Horiz. Maxi-Mill, Motor in base, Vert. Head.

#08 CINCINNATI Vert. Mill, Plain & Rotary Table Type.

#3B KEARNEY & TRECKER Vertical Milling Machine, Motor in base.

No. 0-8 CINCINNATI Rise & Fall Horiz. Mill, Late Model.

No. 3B KEARNEY & TRECKER Horiz. Mill, Double Overarm, Motor in base.

No. 2M CINCINNATI Universal Horizontal Mill, Full Equipment, M.D.

96" x 86" x 28' NEWTON PLANER TYPE MILLING MACHINE. 2 Heads on Rail; 2 Side Heads; Pendant Control; Late Type; Inspect under power.

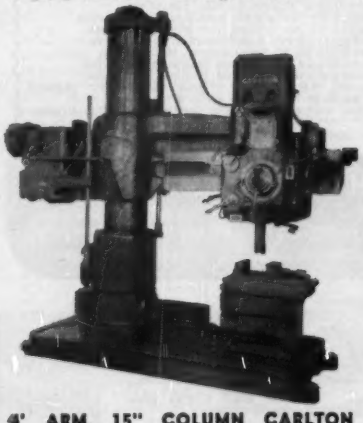
DRILLING MACHINES

4'x15" Column CINCINNATI-BICKFORD "Super-Service" Radial Drill, Motor on arm, Box table.

No. 262 BARNES Motor Driven Sliding Head Drill Press. 2" cap. in steel.

No. 2 M.T. Six Spindle ALLEN Type KH Drill Press, Individual Motor Drive. Late Type.

No. M200 DEFIANCE Prod. Drill, 2" cap., #5 M.T., 26" swing, 1942.



4' ARM, 15" COLUMN CARLTON RADIAL DRILL. 48 SPINDLE SPEEDS 15-1500 RPM. MOTOR ON ARM. 1943.

½, 1½ BUFFALO FORGE Universal Ironworker, Notcher and Coper, M.D.

6'x¼" VERSON Power Press Brake, 8' overall, late type. 100 Tons Cap.

GRINDERS

12"x36" LANDIS Universal Cylindrical Grinder, Excello Internal Spindle, M.D.

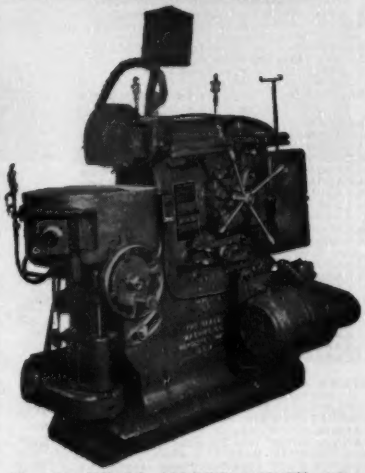
6"x18" LANDIS Type "C" M.D. Hyd. Cylindrical Grinder, Serial #29196.

6"x18" NORTON Vertical Hydraulic Surface Grinder, complete with magnetic chucks, coolant systems, Late.

#TG615 JONES & LAMSON Thread Grinder, Late, M.D. and TG848.

No. 208 BESLEY Motor Driven Disc Grinder, 26" wheels, Late Type.

12"x36" MATTISON M.D. Hydraulic Surface Grinder, 15 HP Spindle Motor.



No. 22 HEALD MOTOR DRIVEN ROTARY SURFACE GRINDER. 12" Magnetic Chuck. Late Model.

20", 24", 28" GOULD & EBERHARDT V-Ram Shapers, M.D.

No. 194 BARNES Vertical Hone, 4" capacity, 12" stroke, Motor Driven.

30 K.W. LEPEL High Frequency Induction Heater.

No. 8LS FELLOWS M.D. Gear Lapping Machine. With Detachable Head, Universal Work Support.

No. 20, WATERBURY FARREL Thread Roller, ⅜" cap., 1944.

15' x 10' x 36' BETTS PLANER, DOUBLE HOUSING, BOX TABLE, 2 Swivel Heads on Rail; 2 Swivel Side Heads; Pendant Control Variable Speed Main Drive Motor, 75 HP. Inspect under power.

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AUTOMATIC SCREW MACHINES
ACME GRIDLEY RG 1¾", 6-spindle; late type
ACME GRIDLEY RB, 1⅝", 8-spindle; late type
CONOMATIC 1¾", 8-spindle; M.D., late type
CLEVELAND 3⅜" Model "A" Single spindle late
CLEVELAND 8", Model "A", single spindle; late
NEW BRITAIN GRIDLEY Model 865; 6-spindle chucker; latest type; new 1943.

BORING MILLS—Horizontal
NILES 8" bar; floor type; motor drive
HEALD 46B and 47A single end Borematic; M.D., late
HEALD No. 48A single end Boramatic; M.D.
HEALD No. 48 double end Boramatic; M.D.

BORING MILLS—Vertical
BULLARD 8", 8-spindle & 16" 6-spindle Type "D" Mult-au-matic; late type
BULLARD 24" & 54" spiral drive, M.D., late type
NILES 53", 2 swivel heads, PRT; M.D.
NILES 100" 2 swivel heads, PRT; M.D.
SELLERS 144", 2 swivel heads on cross rail; PRT

BROACHES
CINCINNATI 1-36 Duplex Vertical cap. 1 ton 30" stroke; Hydraulic; late.
COLONIAL VG1-10-48 Vertical; Hydraulic; late
LAPOINTE 10-54" Vertical, Model SRV; new 1947
OILGEAR 3XA horizontal; cap. 20,000 lb; 96" stroke; hydraulic; late type
OILGEAR type XL-6 single ram; late type.

DRILLS
AMERICAN 4' arm 11" col. "Hole Wizard"; late
AMERICAN 5' arm 11" col. "Hole Wizard"; late
AMERICAN 5' arm 13" col. "Hole Wizard"; late
BARNES #201-½, 4 spindle, M.D., late type
BARNES H-2 Hydram, 2" capacity; M.D., late type
NATCO B3B Hole Steel, 12 adj. spindles; late type
NATCO Model B4B arranged for 60 spindles, late
NATCO Model E5 arranged for 12 spindles; late

FELLOWS GEAR EQUIPMENT
FELLOWS No. 6 High Speed Gear Shaper; late
FELLOWS No. 4B High Speed Gear Shaper; internal cap. 72" diameter; late
FELLOWS No. 6IA High Speed Gear Shaper; late
FELLOWS No. 6Z2 High Speed Gear Shaper; late
FELLOWS No. 7A High Speed Gear Shaper; late
FELLOWS No. 7S High Speed Gear Shaper; late
FELLOWS No. 13LS Lapper; motor drive, late

GLEASON GEAR EQUIPMENT
GLEASON 3" Spiral Gear Generator; late
GLEASON No. 4 Tester; late type
GLEASON 11" Straight Bevel Gear Gen.; M.D.
GLEASON No. 7 Hyp. Cutter Sharp; latest type
GLEASON No. 12 Tool Sharpener; motor drive
GLEASON No. 13 Hyp. Cutter Sharpener; late
GLEASON 12" Spiral Bev. Cutter Sharpener; M.D.
GLEASON 12" Straight Bevel Generator; late
GLEASON No. 14 Spiral Bevel Hyp. Gear Grinder
GLEASON No. 15 Quenching Press; late type
GLEASON No. 17 Spiral Bevel, Zerol and Hypoid Gear Grinder, M.D., late
GLEASON 18" Straight Bevel Gear Gen.; M.D.
GLEASON No. 18 Gear Tester and Lapper; M.D.
GLEASON No. 20 Spur Gear Tester; latest type
GLEASON #22 Hypoid Formate Gear Finisher; late
GLEASON 24" Bevel Gear Planer; motor drive
GLEASON 25" Straight Bevel Gear Gen.; M.D.
GLEASON 37" Bevel Gear Planer; M.D.
GLEASON 28" Spiral Bevel Gear Gen.; M.D.
GLEASON No. 5 Revacycle 5" cone distance; late

GRINDERS, Cyl. Plain & Univ.
BROWN & SHARPE #13 Universal Tool and Grinder; late type
CINCINNATI 14"x72" Universal; M.D., late type
CINCINNATI 6"x18" Plain, "Filmatic"; late type
LANDIS 10"x18" type CC Plain, Hydraulic, late
LANDIS 14"x36" type DC plain hydr. with infeed; late
NORTON 4"x12" Model CTU Plain, year 1953
NORTON 6"x18" Type "C" Plain; late type
NORTON 16"x72" type "C" Plain; late type

GRINDERS, Internal
BRYANT #5, #16-C-16 Hydraulic; late type
BRYANT #24-36" Hydraulic; late type
HEALD #70A int. M.D., late type
HEALD #8I Plain chuck type; New 1947
HEALD #72AS Plain & "Gagematic"; late type

GRINDERS, Surface
ABRASIVE #34, 8"x24" table; late type
HEALD #22 Rotary, 12" chuck; M.D., late

LATHES, Turret
BARDONS & OLIVER #5 Univ. Ram Type; late
GISHOLT #1L and #2L Saddle type; Timken; late
GISHOLT #3 Universal ram type; M.D., late
MOREY #2, #3, #4 ram type; Timken; latest type
WARNER & SWASEY #1-A Universal; Hex., late
WARNER & SWASEY #2 All Geared Head; late
WARNER & SWASEY #3 and #5 Univ. ram type

LATHES, Engine & Mfg.
HENDEY 24"x36" centers; M.D., late type
LeBLOND 36"x204" Heavy Duty; PRT; Timken; late
LeBLOND 42"x108" H.D., Timken; M.D., late type
LODGE & SHIPLEY 12"x30" G.H. Toolroom
LODGE & SHIPLEY 14"x30" centers; late type
MONARCH Model EE 10"x20" Toolroom; late
MONARCH 12"x30" centers; Model CKK; late type
NILES 30"x50" bed, single end boring, "Time Saver"
PRATT & WHITNEY 16"x30" centers; Timken
REED PRENTICE 14"x54" Model B, Timken, late
SUNDSTRAND 60" centers; auto Type B; late

MILLING MACHINES, Plain
BROWN & SHARPE #2 M.D. late type
CINCINNATI 1-16 Production; Timken; late type
KEARNEY & TRECKER 2H, 2HL & 4H, M.D., late

MILLING MACHINES Thread
HALL Style "D" Planetary; late type
LEES BRADNER Model #LT 6"x36" #HT 12"x24" and #HT 12"x36" centers; late type
MOREY 12"x30" and 12"x160" centers; late type

MILLING MACHINES, Universal
BROWN & SHARPE #2 Universal Miller; late type
CINCINNATI 2MH Univ., motor drive, late type
CINCINNATI #3 Dial Type, Timken, M.D., late
KEARNEY & TRECKER #3K; Timken; late type
VAN NORMAN #22L, #26 and #36 ram type; late

MILLING MACHINES, Vertical
CINCINNATI #4 H.S. Dial type; late
CINCINNATI 0-8 Vertical; Timken; late type
CINCINNATI #3 Dial Type; High Speed, New 1953
KEARNEY & TRECKER #3H and #4H H.S. late

PLANERS
GRAY 36"x36"x10' "Maximum Service" 4 hds; PRT; DC; Reversing
GRAY 48"x48"x10' "Maximum Service" 4 hds; PRT; DC; Reversing
LIBERTY 144"x76"x48' adj. openside; box table; 4 hds; vari-voltage; PRT; New 1940
NILES-BEMENT-POND 72"x72"x30'; 4 hds; PRT; DC; M.D.

PRESSES
BLISS #410A, 525-ton double action toggle drawing press; M.D.
NATIONAL #5 "Maxi-Press", 1000-ton cap. H.B. Forging Machine; M.D.
SHAW 250-ton Hydraulic flanging press; late
WATERBURY FARREL #9, 125-ton cap., M.D.

MISCELLANEOUS
ALEXANDER #2, 3-dim. Engraving' NEW 1952
BAKER No. 5 Keyseater; motor drive
BARNES No. 172, 214 Honing; M.D., hydr.; late
FISCHER No. 1 Oil Groover; M.D.; late
HILLES & JONES #7 Plate Bending Roll; M.D.
LANDIS 2" Double Spindle, Threaders
LeBLOND No. 2 Deep Hole Reaming, late type
LeBLOND No. 2 Deep Hole Rifling, late type
MANVILLE No. 3 Belt Head Trimmer, M.D.
MANVILLE 2C Screw Slotter, Motor Drive
MANVILLE No. 1 Screw Slotter, Motor Drive
SCIAKY Type RMCO 45-10 Elec. pot Welder
HUGH SMITH cap. 1" thick plate x 28' between housings-Plate Bend. Roll, M.D.
VAN NORMAN No. 639 Oscillating Radius Grinder

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LATHES
14"x54" cc MONARCH, hardened ways, chucks, coolant, new 1946
16"x54" cc SIDNEY Tri-Trol, taper, chucks, coolant, new 1942
28"x15' cc BERTRAM (Niles), 2 carriages, taper, chucks, new 1943

MILLS
No. 2MI CINCINNATI Plain Horizontal, new 1946
No. 2MI CINCINNATI Vertical, new 1951
No. 3 CINCINNATI High Speed Dial Type Vertical, new 1951

TURRET LATHES
No. 4 WARNER & SWASEY, preselector head, bar feed, new 1942
No. 4L GISHOLT, 12½" spindle, cross sliding turret, new 1948

SHAPERS
16" GOULD & EBERHARDT Industrial, 5HP motor, new 1943
36" ROCKFORD Hydraulic Openside Shaper, new 1948

DRILLS
4'-11"FOSDICK Sensitive, new 1951
6'-17" CINCINNATI BICKFORD Super Service, new 1939

BORING MILLS
3" bar YODER, table 24"x48", new 1942
4" bar GIDDINGS & LEWIS, 36"x96" table, new 1943
6" bar No. 360F GIDDINGS & LEWIS Floor Type, floor plate, new 1944

GRINDERS
16/20"x36" NORTON Type "C", raised in sand, new 1944
16/20"x72" NORTON Type "C", raised in sand, new 1943
16/40"x120" NORTON Gap Grinder, gap 19" long, new 1941
No. 6G SELLERS Drill Grinder, new 1944

BIG TOOLS—PRICED RIGHT
10' CINCINNATI Vertical Boring Mill, swing 128", 72" under rail, 30 HP motor
60"x120" cc NILES Heavy Duty Lathe, forced feed lubrication, power rapid traverse, 25 HP & 2 HP motor
30" MORTON Hydraulic Keyseater, 4½" to 30" capacity, new 1942
48"x48"x12' DETRICK & HARVEY Planer, widened to take 69" between housings, 20 HP DC reversing motor

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#2 Cincinnati Plain Horiz. Miller Dial Type, High Speed
8" Niles Bement Pond Spring Mill Serial #12755
3'9" MORRIS MOR-SPEED RADIAL DRILL
20"x10' Bed L&S Model E Sc-
lective Head Engine Lathe —Serial #29286
No. 47 Head Single End Borematic—Serial #4646
22"-44"x80" Bed Putnam Sliding Bed Gap Lathe
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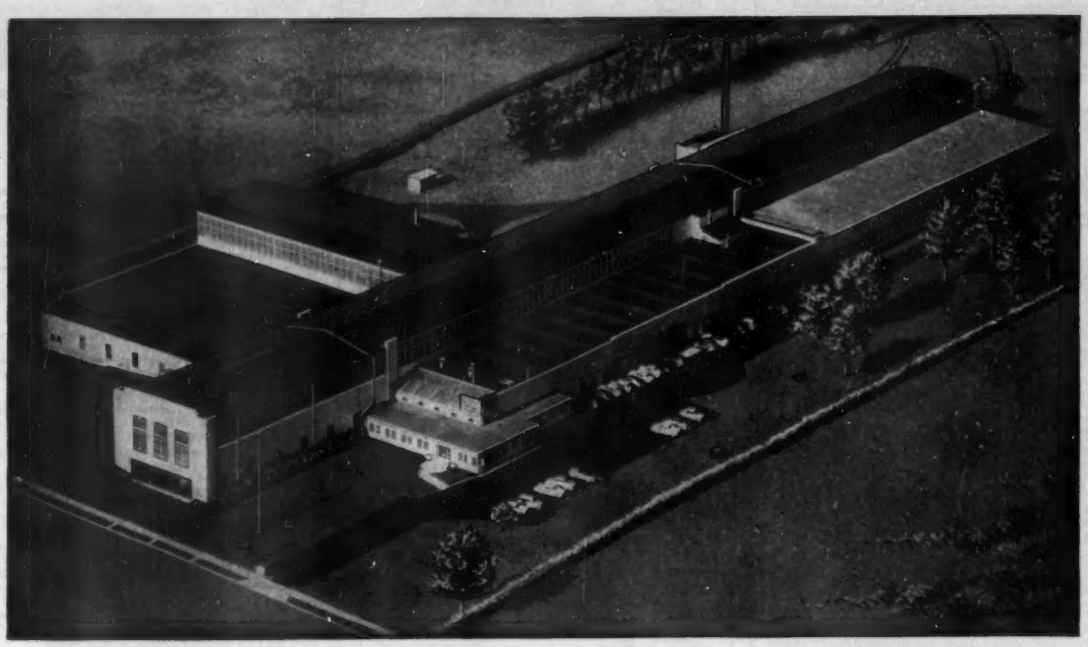

ENGINE LATHES

Gems "Copyter" Duplicating Attachment, m.d.
Model TR 59 Hardinge High Speed Production Lathe, m.d.
12"x6' Lodge & Shipley Geared Head, m.d., taper
12"x84" centers Lodge & Shipley Geared Head, m.d., taper
14"x61½" centers American Geared Head, m.d.
14"x30" centers Bradford Lathe, Timken
14"x6' American High Duty Geared Head, m.d., taper
14"x6' Hendey Geared Head, m.d., taper
14"x6' Lodge & Shipley Geared Head, m.d.
14"x6' Pratt & Whitney, cone
14"x6' LeBlond, cone
14"x6' LeBlond, Geared Head, s.p.d.
14"x6' bed Monarch, cone, motorized
14"x6' Sidney Geared Head, m.d.
14"x6' Springfield Geared Head, m.d., taper
14"x6' Sidney Geared Head, m.d.
14"x6' Prentice, m.d., taper
16"x30" centers Monarch, m.d., taper
16"x6' bed Cisco Geared Head, m.d.
16"x6' Hendey Geared Head, m.d.
16"x6' Hendey Yoke Head, taper
16"x6' Lohmann Geared Head, m.d.
16"x8' Lodge & Shipley Selective Head, m.d.
16"x8' bed Monarch Geared Head, m.d.
16"x8' Monarch, cone, motorized
18"x12' bed LeBlond Geared Head, m.d., taper
18"x14' Monarch, m.d., taper
17"x8' LeBlond Geared Head, m.d.
18"x5' LeBlond Geared-Head, m.d.
18"x6'6" bed Greaves-Klusman Geared Head, m.d.
18"x96" centers Sidney, m.d., timken, late
18"x7' Hendey Geared Head, m.d., taper
18"x8' bed American Geared Head, m.d.
18"x8' Hendey Geared Head, m.d., taper
18"x8' Lodge & Shipley Geared Head, m.d.
18"x8' Whitcomb-Blaisdell Geared Head, s.p.d.
18"x8'6" bed Walcott, cone, motorized
18"x10'6" bed Beye & Emmes, cone, motorized
19"x4' centers LeBlond, H.D., m.d.
19"x6' bed LeBlond Geared Head, m.d., later type
19"x10' bed LeBlond Geared Head, m.d.
19"x16' bed LeBlond Geared Head, m.d.
20"x8' bed Cisco, cone, motorized
20"x8' bed Greaves Klusman Geared Head, m.d. In log
20"x8' bed Beye & Emmes, m.d.
20"x8' bed Lodge & Shipley Geared Head, m.d., taper, late type
20"x10' Sidney Geared Head, m.d.
20"-40"x9' bed Rahn-Larmon Gap Lathe, cone, motorized
20"x10'6" Beye & Emmes, cone, motorized
20"x10'6" bed Sidney "Tritrol" Geared Head, m.d., late
21"x8' bed LeBlond Geared Head, m.d., taper
23"x12' bed LeBlond, cone, motorized
24"x12' LeBlond Geared Head, m.d., taper
24"x12' bed Beye & Emmes, belt drive
24"x12' Bridgeford Geared Head, m.d., taper
24"x13' bed Lohmann Geared Head, m.d., taper
24"x16' bed Lodge & Shipley, cone, motorized
24" Raised to swing 32"x22' bed—16' centers New Haven, cone, taper
25"x10' bed LeBlond Geared Head, m.d., taper
30"x10' bed Betts-Bridgeford, m.d.
30"x12'6" bed Niles-Bement-Pond, variable speed m.d., taper
30"x13'6" bed Niles-Bement-Pond, m.d.
30"x18' LeBlond Geared Head, m.d., 8'10" centers
30"x40' bed (33' centers) Betts-Bridgeford Heavy Duty Hollow Spindle "Oil Country" type, m.d.
36"x84" centers American "Super-Productive", m.d.
36"x16'6" bed Beye & Emmes Geared Head, m.d.
36"x18' Putnam, m.d.
38"x17' centers American Super-Productive Geared Head, m.d.
40" raised to 48½x108" centers LeBlond, m.d.
42" raised to swing 50"x20' bed Lodge & Shipley, m.d.
42"x14' bed American Geared Head, m.d.
42" Putnam raised to swing 56½x20' bed Geared Head, m.d., 11'0" centers
48"x33' centers Niles-Bement-Pond, m.d.
63"x7' centers J. H. Johnson, m.d.
72"x7' centers I. H. Johnson, m.d.

MANUFACTURING LATHES

12x18" Reid Small Piece Production Lathe, Model 6WSL, m.d.
No. 3 Lodge & Shipley Duomatic, m.d., late type
No. 3A Lodge & Shipley Duomatic, m.d., late type
No. 3 Niles-Bement-Pond Axle Lathe, m.d.
Model B1 Blount Speed Lathe, m.d.
W. C. Lipe Carbo Semi-Automatic, m.d., late
W. C. Lipe Carbomatic, m.d.
Colberne Mfg. Bench Type Speed Lathe, m.d.
No. 4 LeBlond Boring Lathe, 37" bed, 4" hole, m.d., latest
No. 9, 12 LeBlond Multi-Cut, m.d.
4x60" LeSwing, m.d.
8x108" LeSwing, m.d., taper, latest
8x132" LeSwing, m.d., latest
9x12" Sundstrand, s.p.d.
11x18" LeBlond Rapid Production, m.d.
12x18" centers Monarch Model 5T, m.d.
Schaer Type NA 2B Speed Lathe, m.d., latest
30"x10' LeBlond Turning Lathe, cone
No. 12 Gisholt Semi-Special Automatic Production, m.d.

HAND MILLING MACHINE

Van Norman, m.d., latest

PLAIN MILLING MACHINES

No. 1B Milwaukee, m.d.
No. 1½ Brown & Sharpe Plain, cone, motorized
No. 2 Rockford, m.d.
No. 4 Ohio, cone
No. 3 Standard Plain Type Milwaukee, m.d.
No. 3B Milwaukee, m.d.
No. 3B Brown & Sharpe, m.d.
No. 36 Van Norman Plain Miller

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42" Bullard New Era vertical T/L
3½" Bar No. 32 Lucas, horizontal, table type
36" Rogers vert. T/L, side head, new 1942
36" Bullard vert. T/L, side head, #11325
72" Niles Cement Pond 2 heads, PRT, #17623
No. 48 Heald Boromatic precision late type

DRILLS, RADIAL

3½ ft. arm 8" column American sensitive
4 ft. arm 13" column Carlton, M1B, late type
9 ft. arm 16" column American, late type.

GEAR HOBBERS

No. 12H Gould & Eberhardt universal
No. 36H Gould & Eberhardt universal
72" Sebuchardt & Schutte universal

GEAR MACHINERY, MISC.

10" Pratt & Whitney hyd. gear grinder, 1944
12" Model 234 Illinois involute profile measuring machine, new 1943
13" Model Sheffield gear chamferer, 1947
No. 3 Barber Colman auto. hob sharpener, 1944
Nos. 71A, 73A, 712 and 715 Fellows H8 shapers.

GRINDERS, CYLINDRICAL

4"x18" Cincinnati pl. hyd., plunge cut, 1946
10"x18" Norton type BA, A C. late models
10"x18" Cincinnati Almatic, type ER (2), 1941-1348
16"x36" Norton type C hydraulic (2), 1943
14"x36" Landis type C, hydraulic (2), 1946
16"x36" Norton type C, hydraulic (2), 1943
16"/28"x72" Norton type C, hydraulic, 1945
16"/40"x120" Landis gap type, hydraulic, serial 16193
16"/48"x98" Landis gap type hydraulic, new 1941

GRINDERS, SURFACE

16A2 Blanchard rotary surface, serial 6046, new 1946.
6"x18" Norton vert. spdl, hydraulic, 1942
8"x22" No. 3 Abrasive, motor in base (2), 1941
12"x48" Model 300 Hanchett vert. spdl, 1946
14"x36" Pratt & Whitney vertical surface grinder, 1942.
72" No. 72 Hanchett rotary surface, 1948

GRINDERS, MISC.

No. 2 Cincinnati univ. tool and cutter, new 1942
No. 13 Brown & Sharpe universal tool, new 1942
No. 2 Cincinnati cutter grinder, late model
30" Ingersoll cutter grinder, late model

INTERNAL GRINDERS:

Nos. 72, 72A3 and 72A5 Heald
No. 5 Bryant semi-automatic chucking
No. 2 Cincinnati centerless (3), 1942-1943
No. 45 Van Norman radius, 1943

LATHES, ENGINE

14"/28"x36" centers Smith-Drum, gap, 1945.
14"x42" Hendey G.H., M.I.B., 1940
24"x14 ft. bed American G.H., G.C.G., serial 44870
52"x30 ft. bed Niles Cement Pond G.H., like new

LATHES, MFG. & MISC. & TURRET

14"x18" Lipe H. S. Carbo-lathe, 1943
17"x72" LeBlond Rapid production (5), 1948-1947
No. H8 Libby International saddle type universal turret lathe, 1940
No. 5 Jones & Lamson Universal ram type turret lathes, (2) late models

MILLING MACHINES

No. 2 Brown & Sharpe vertical
No. 2 Cincinnati Hi-Power plain horizontal
No. 4 Cincinnati Hi-power plain horizontal
No. 5 Cincinnati Hi-power plain horiz., vert. attach.
No. 2-16 Cincinnati production mill, late
1-12 Cincinnati production miller
No. 4-3B and 4-4B Cincinnati Hydromatic production
No. 2 Cincinnati high speed dial type plain
No. 2B and 3K Milwaukee universal
No. 3B and 3K Milwaukee universal
No. 3B and 4K Kearney & Trecker plain, late type
No. 22L Van Norman universal, 1943
No. 6 Becker heavy duty vertical
24"x24"x12 ft. Ingersoll adj. rail planer type mill, tracer controlled, 1945
30"x21"x12 ft. Ingersoll fixed rail planer type mill
42"x42"x18 ft. Ingersoll adj. rail double housing mill, 2 S.H. and 1 R.H. power on rail and head
42" Ingersoll 3 spindle rotary continuous mill
42" Ingersoll 2 spindle rotary continuous mill
48"x20"x20 ft. Ingersoll fixed rail double faced planer type mill
60"x48"x16 ft. Ingersoll adj. rail double housing planer type mill, 2 S.H. and 2 R.H.
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400 ton No. 863 Toledo knuckle joint
100 Ton No. 9307 Toledo SS, DC, air cushion.
250-ton EG53 Ferracute Knuckle Joint coining
800 Ton Cleveland Knuckle-joint coining, serial 8245, new 1947.
2 to 70 ton Ferracute punching (several)
3 to 80 ton O.B.I., most every make
900 ton No. 1042 Verson, steel frame, air clutch, late model

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6" Pratt & Whitney vertical shaper
24" Gould & Eberhardt ind. universal shaper
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32" Gould & Eberhardt Invincible, F.M.D.
36" Rockford vert. hyd. slotter, 1942

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Milwaukee #2H Sliding Head Vertical—Range 28"x12"x15"—Speeds to 1400 RPM—MD
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Warner & Swasey #2 Model M-1330—Cap. 1" round—Electric bar feed—MD
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36"x17' centers AMERICAN Heavy Duty Geared Head Lathe, 1941
42"x15' AMERICAN Heavy Duty Lathe
42"x25' centers AMERICAN Heavy Duty Lathe
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Nos. 4D and 6S POTTER & JOHNSTON Automatic Lathes
IL GISHOLT Universal Turret Lathe, 1946
No. 8A JONES & LAMSON Saddle Type Universal Heavy Duty Turret Lathes
No. 2 CINCINNATI HS Dial Type Plain Millers
No. 0-S CINCINNATI Plain Milling Machines.
No. 2M CINCINNATI Vertical Miller 1941
FITCHBURG Plain Horizontal Mfg. Type Milling Machine, 24"x72" table
No. 1-1S CINCINNATI Plain Mfg. Miller
No. 3B BROWN & SHARPE Dual Control Plain Miller
No. 5 CINCINNATI High Power Plain Miller with motorized overarm
3'11" CARLTON Radial Drill motor-on-arm
CINCINNATI BICKFORD Precision Drilling Machine with Bullard Man-au-Trol Table
E-5 & 2AL NATCO Multiple Spindle Drilling Machine
Nos. 64 and 72 FELLOWS High Speed Gear Shapers
No. 12 FELLOWS Gear Shaver, 1943
No. 36BM GOULD & EBERHARDT Gear Rougher
36" OHIO "DREADNAUGHT" H.D. Shaper
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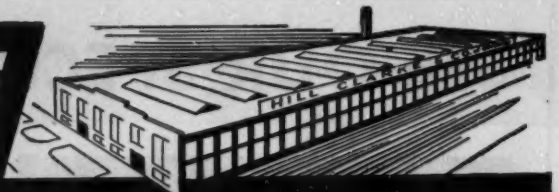

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Boring Machines
No. DB2112 Excello Single End Borer.
100" Niles-B-Pond Vert. Bor. Mill.

Drills
4'11" American Hole Wizard Radial Drill
No. 2 Avey Cam Fd. Drill. 14" Swing.
No. 2MA-6 Avey 24"-1 Spol. Drill.
2 Spdl.—24" SW.—No. 3 Avey.
No. K60H Fox 16 Spdl. Multi Drill
No. 2-20" 2 Spdl. Leland-Gifford LMS Drill
No. LBM-20" 3 Spdl. Leland-Gifford Drill.

Gear Machines
11" Gleason Gear Generator.
No. 12HS Gould & Eberhardt.
No. 36-BM G. & E.—3 spdl. Rougher.
616-A Fellows Gear Shaper.
612-A Fellows Gear Shaper.

Grinders
6"x18" Norton Type C Plain (1943).
10"x18" Norton Type C Plain Hyd. Cam Gdr.
10"x36" Norton Type C Grinder.
10"x36" Norton Type C Cam Grinder.
16"-40" Gap x 120" Norton Pl.
18" x 120" Norton Type C Pl.
20" x 192" Norton Type A Pl.
B-24—25" Chuck Arter Surf. Gdr.
TG615 J & L Thread Gdr.
No. 214 Besly Double End Disc Gdr.

Internal Grinders
No. 5 Bryant Internal Grinder.
No. 5B Bryant Internal Grdr.
No. 16-16 Bryant Int. Grinder.
No. 16-28 Bryant Int. Grinder.
No. 16-38 Bryant Int. Gdr.
No. 24 L-36 Bryant Hyd. Int. Gdr.
No. 16 A-28 Bryant Internal Grinder.
No. 24-26 Bryant Int. Grinder.
No. 24-36 Bryant Internal Grinder.
No. 81 Heald Internal Centerless.
72-A5 Heald Int. Gdr. (1942).

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10"x36" Centers. 14"x36" Centers.
10"x72" Centers. 14"x50" Centers.
10"x96" Centers. 14"x72" Centers.
18"x96" Centers. 14"x96" Centers.
18"-30" gap x 96" Centers.

Hones
Model H-2 Micromatic Horiz. Hone.
Model 200-H5-Dbl. End. Micro. Horiz.
Model H-7 Micromatic Vert. Hone, etc.
No. 224 Barnes Vert. Hone.
No. 306-H Barnes Vertical Hone.

Lathes
R-14 Lo-Swing Automatic Lathe.
12"x21" Fay Automatic Lathe
12"x63" Fay Automatic
18"x6' Am. Geared Head Lathe.
27"x12' American Geared Hd. Lathe.
36"x18' Putnam Grd. Hd. M.D.

Turret Lathes
No. 5W Acme Tur. Lathe (Late).
No. 2 Warner & Swasey Geared Head.
No. 3AL Gisholt, Cross-Slide Turret.
No. 3 Warner & Swasey Turret Bar Feed.
No. 4A Warner & Swasey Turret.
No. 6 Warner & Swasey, cone head.
2¼"x24" Jones & Lamson.
18" Libby, M.D.
No. 3H-10 Libby International, 29" SW
No. 4A Warner & Swasey (1944).

Planers
48"x36"x14' Gray, 2 Heads.
48"x48"x12' Cincinnati, 2 Heads.
60"x48"x27' American, 4 Heads.

Milling Machines
No. 4 Cinn. Pl. Hi-Speed Dial Type (1944).
No. 3K Kearney & Trecker Vert.
No. 08 Cincinnati Vert. (1942).
10"x48" Hanson-Whitney Thrd. Mill.
10"x60" Pratt & Whitney Thrd. Mill.
12"x102" Mod. HT Lees Bradner Thrd. Mill.
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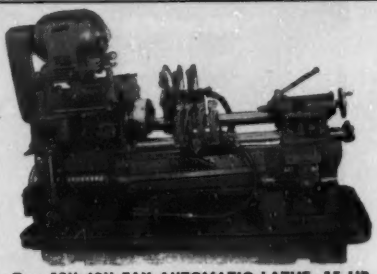

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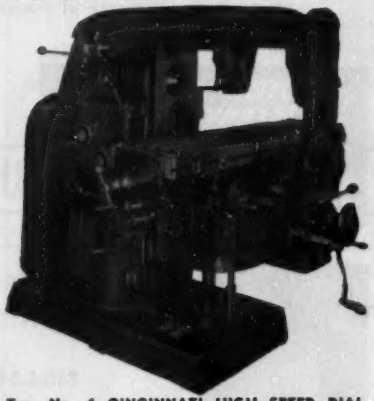

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1—Fellows Model 75 High Speed Gear Shaper S/N 15610
2—Fellows Model 725A High Speed Gear Shapers S/N 18714-19201.
3—National Red Ring GCC 8" & 12" Gear Shavers S/N 170, 334, 100
1—Cross 241 Duplex Chamfering Machine S/N 578
1—4T Fellows Thread Generator S/N 11012

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4—⅝" National Bent Shank Nut Tappers
2—⅞" National Bent Shank Nut Tappers

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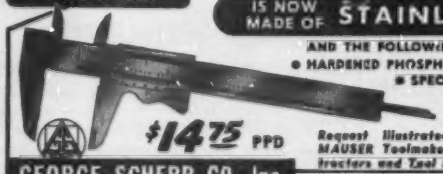

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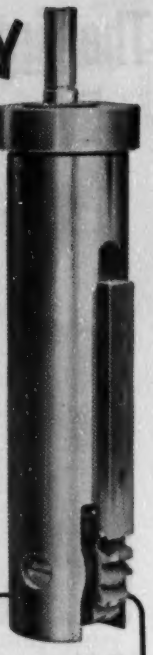
The INSIDE STORY about NATIONAL Keyseating Millers



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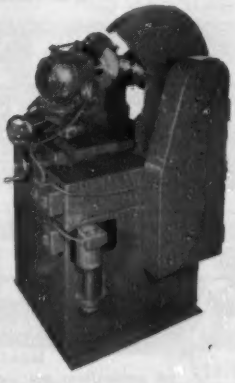

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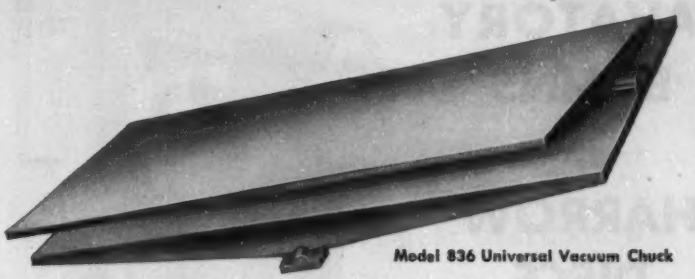

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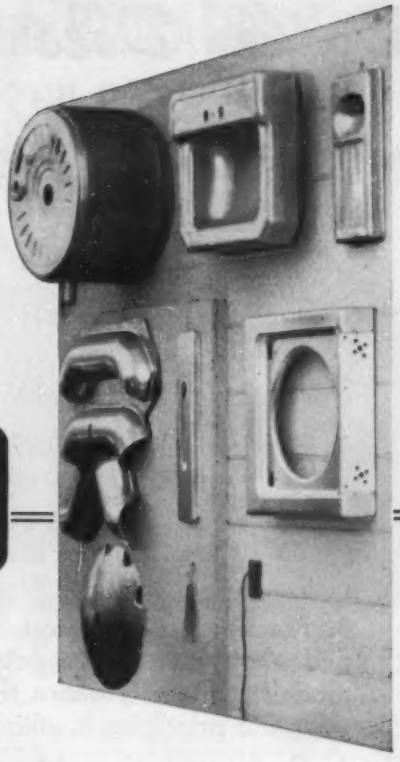

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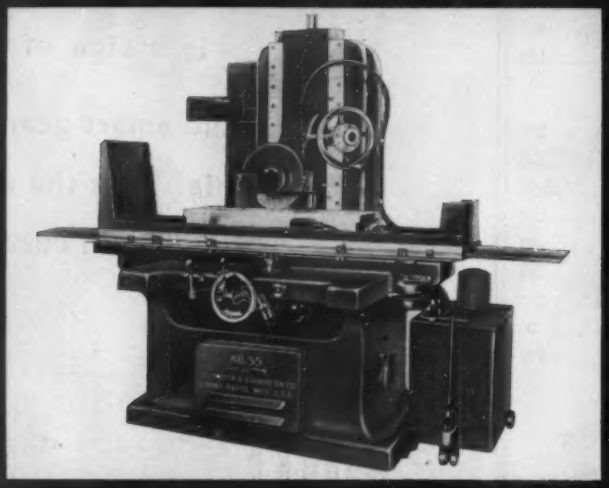

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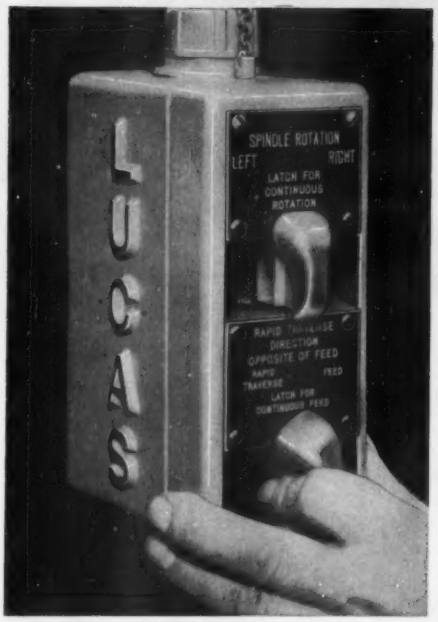

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Two smooth operating switch levers in this small-dimension pendant do the work of ten control buttons. The position of the levers gives quick visual indication of engagement and direction. One of many features that is keeping Lucas out in front among horizontal boring, drilling and milling machines.

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THE NEW BRITAIN MACHINE COMPANY • CLEVELAND 8, OHIO

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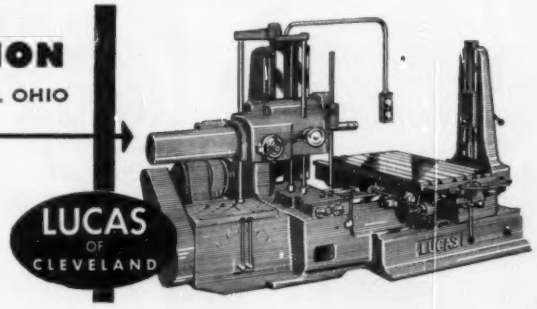
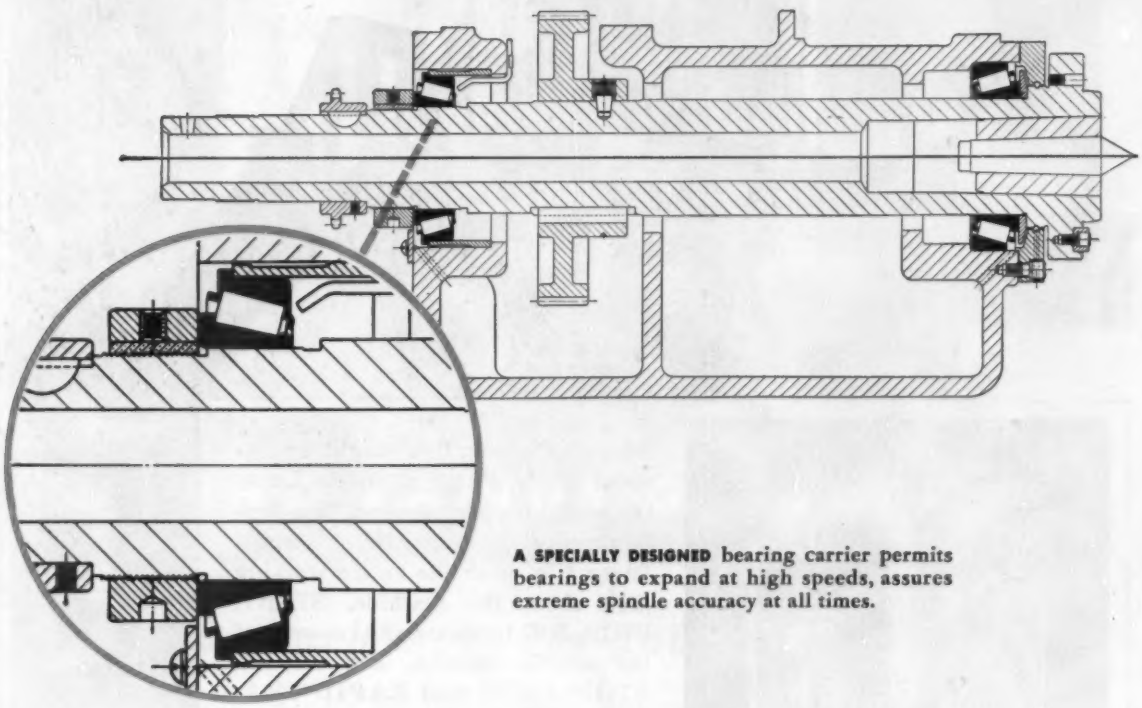
Lucas Horizontal Boring, Drilling and Milling Machines

Our general catalog is filed in the Sweet's Machine Tool Catalog File.



How to maintain extreme spindle precision from low to very high speeds:

TIMKEN® bearings with semi-flexible mounting



A SPECIALLY DESIGNED bearing carrier permits bearings to expand at high speeds, assures extreme spindle accuracy at all times.

THE Timken Company has an ingenious solution to the problem of maintaining a high degree of spindle precision in machine tools. At high speeds, bearings expand. Normally this would cause the bearings in a precision mounting to tighten up and become excessively preloaded. But engineers at the Timken Company have developed a semi-flexible mounting. The rear spindle bearing is mounted in a special carrier. The carrier is designed to permit the rear bearing to expand radially while the entire spindle assembly expands longitudinally. As a result the desired bearing setting is maintained under all operating speeds. Extreme spindle accuracy is maintained at all times.

Timken® tapered roller bearings with these mountings have been applied to the spindles of many types of machine tools with great success. Of course not all machine tool spindles are required to operate at high speeds and over a variable range of speeds. The conventional Timken spindle mounting is entirely adequate for most machines.

Whatever your requirements, there are Timken tapered roller bearings to meet them. If not we'll find a new way, as we did when machine tool builders originally asked for precision bearings. And as we did when they asked for greater accuracy, which led to the famed Timken "O" and "OO" bearings. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

TIMKEN

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TAPERED ROLLER BEARINGS

NOT JUST A BALL ○ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ⬯ AND THRUST →⬯← LOADS OR ANY COMBINATION →✳←